

Vol. XL

APRIL, 1930

No. 4

THE LARYNGOSCOPE

AN INTERNATIONAL MONTHLY JOURNAL
DEVOTED TO DISEASES OF THE

EAR - NOSE - THROAT

FOUNDED IN 1896 BY

DR. M. A. GOLDSTEIN

Managing Editor and Publisher.

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Assistant Editor.

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Subscription, \$6.00 per Annum, in Advance.

Foreign Subscription, 35 Shillings per Annum, Post Free.

Single Copies, 75 cents.

PUBLISHED BY THE LARYNGOSCOPE CO.

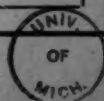
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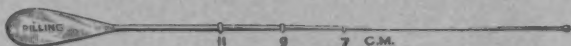
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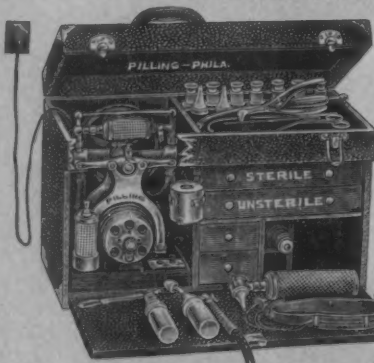
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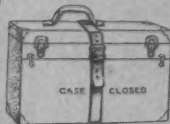
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THE LARYNGOSCOPE.

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ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding
that they are contributed exclusively to THE LARYNGOSCOPE.)

A STUDY OF MASTOIDITIS—A RESUME OF 644 CASES.*

DR. GEO. M. COATES, DR. MATTHEW S. ERSNER AND

DR. ABRAM H. PERSKY, Philadelphia.

The purpose of this paper is to give an analysis of the cases of mastoiditis and their associated complications that were admitted to the Coates otological service at the Medico Chirurgical and Graduate Hospital for the University of Pennsylvania. This resumé extends from the beginning of 1922 to June of 1929, inclusive.

During this period there have been approximately 644 cases admitted. This group of cases will show a variety of interesting information. Some will be merely a repetition of very well established impressions concerning the usual run of cases in the average large hospital. On the other hand, we have quite a number of interesting facts that seem well worth reviewing, either for the purpose of emphasis, even at the danger of repetition of well known beliefs, or because of new observations on our service.

Statistical: In this summary of 644 cases, there were 605 cases that were operated upon, and 39 that did not have any operations. In addition, there were 54 bilateral mastoidectomies which brought up the total to 659 operations. Before analyzing this group of 605 cases, let us refer to the cases that were admitted on this service and did not have any operations. There is a total of 39 such cases,

*Read before the Philadelphia Laryngological Society, Jan. 7, 1930. From the Department of Otology, Graduate School of Medicine, University of Pennsylvania, 1929.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication Feb. 7, 1930.

35 of which have been classed as true observation cases. They were admitted to the hospital and apparently cleared up without any further operative procedure, except possibly a myringotomy. Four or five of these cases refused operation. The rest of the list speaks for itself, as can be seen in the accompanying Table I.

CASES NOT OPERATED UPON.

1. Observation	35
2. Novocain injection of the occipital nerve.....	1
3. X-ray treatment of the cervical glands.....	1
4. Osteomyelitis of skull (incision).....	1
5. Removal of aural polyp.....	1
Total	39

TABLE I.

In addition there were four cases that had an exploratory operation for brain abscess, four cases of incision of a postauricular abscess, one case of a plastic for a postauricular fistula, one case of curettage of the Eustachian tube, and one ossiculectomy.

Of the second group of 605 cases, reference to Table II will give a comprehensive study of the type of operations, and the relation to the various ages.

THE RELATION OF AGE AND SEX INCIDENCES.

Ages	Simple		Bilateral		Secondary		Radical		Total	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Below 1 yr	23	17	4	5	—	1	—	1	27	24
1—2	16	19	7	7	1	4	2	1	26	31
2—5	41	42	14	8	7	6	1	1	63	57
5—10	52	39	3	3	15	10	5	10	75	62
10—20	29	27	1	—	3	1	14	18	47	46
20—30	19	14	—	2	1	—	15	14	35	30
30—40	15	12	—	—	2	—	12	2	29	14
40—50	9	8	—	1	1	1	—	—	10	10
50—60	4	2	—	—	—	—	2	1	6	3
Over 60	5	4	—	—	—	—	—	—	5	5
	213	184	29	26	30	23	505	51	323	282
Grand Total	605									

TABLE II.

In this present paper we will review the first three columns only, and we will leave the subject of radical mastoidectomies for a later consideration. This first group can be considered either under the heading of simple mastoidectomies or subdivided as has been done in the above table. Of this total of 605 cases, 505 fall into this first group, and they can be further divided into approximately 80 per cent single primary mastoidectomies, 10 per cent bilateral, and 10 per cent secondaries. The bilateral mastoidectomies, numbering 54, are 54 patients, but are really 108 operations performed, increasing the number by 54 to a grand total of 559.

Etiological Factors: Let us again refer to our Table II. Sex seems to have very little influence on the prevalence of mastoid infection. While the general total of simple mastoidectomies runs a little higher for males than for females, there seems to be an almost general equality in every age limit when this is analyzed. There probably is only a slight exception in the five to 10-year period, where the ratio is 50 males to 39 females. In all other age periods there is an almost equal proportion.

As apparently coincident to the prevalence of our acute infections, it seems that the greatest number of cases occur in the periods of two to five, and five to 10 years, with a gradual decrease in both the period under two, and also in that of 10 to 20. The majority of the bilateral cases also tend to point to the younger group of cases; that is, under five years. However, in the group of secondary operations, there seems to be a slight tendency for a little older age period, the reasons for which can readily be appreciated.

A study of Table III will reveal some very interesting points as to the direct causes wherever it was possible to trace them.

DIRECT CAUSES.

1. Colds	119
Coryza	
Sore Throats	
Tonsillitis	
2. Grippe	26
3. Acute Infections	23
Measles	12
Scarlet	5
Diphtheria	2
Pertussis	2
Chicken Pox	1
Mumps	1
4. Pneumonia	7
5. Surgery	23
T. & A.	13
Submucous	9
Sinus	7
6. Injury	5
7. Swimming	4
8. General	1
Antitoxin Reaction	1
Total	208

TABLE III.

The acute cold is, as generally conceded, the most frequent culprit. Under this group, composed of coryza, sore throat and tonsillitis, there is close to 60 per cent of known causes. Grippe, acute infections and surgery are the next important factors, and they apparently run on a par with each other, averaging about 12 per cent of the total. Of the acute infections, measles seems to be the predomi-

nating disease. Under surgery the usual causes are such operations as tonsillectomy and adenoidectomy, submucous resection and sinus operation. Accidental injury to the mastoid was directly traced in five cases. Swimming was at fault only in four cases. There is one curious causative agent noted, *vis.*, antitoxin reaction. This child had had a mastoidectomy performed some time before, and immediately following a preliminary injection of diphtheria toxin-antitoxin for immunization purposes, he developed extreme tenderness and pain over the site of his former operation, accompanied with redness and swelling. Incision and drainage of this led to an uneventful recovery.

There are two other causes that should be included: One was a child who developed a severe attack of sneezing, followed by an otitis media and subsequent mastoiditis; the other case followed an abscess in the throat, probably retropharyngeal.

It is well to study the length of time that the patients complained of symptoms prior to their admission to the hospital. It has been found here that ordinarily the prodromal ear discharge and associated symptoms in the acute cases follow the schedule as seen in Table IV.

DURATION OF SYMPTOMS PRIOR TO ADMISSION TO HOSPITAL.

3-4 days	36	8.5%
1 week-10 days	82	19.6%
12 days to 15 days.....	119	28.4%
3 weeks	58	14.0%
1 month	45	10.8%
1-2 months	62	14.7%
Over 2 months.....	17	4.0%
	419	100.0%

TABLE IV.

It can be seen that in the 419 cases noted, 28.4 per cent were operated upon between the twelfth and fifteenth day after onset. This seems to be the maximum operative point. From this there appears to be a decrease in both directions; that is, in the period prior to 12 to 15 days, and that period following. However, there again is an increase in the one to two-month period. Our impression is that after the acute symptoms have subsided, this secondary group represents that class of cases which are more or less atypical, and have been studied with the hope that they would clear up under non-surgical measures. This, however, is a relative table, as very often the history elicited was meager and not altogether reliable; hence, this table only represents the duration of symptoms prior to admission to the hospital. Operation, while occasionally done on the date

of admission, usually was done several days to a week later. In analyzing the group of 36 cases in the three to four-day period, there were 12 cases that were secondary mastoidectomies, which, in itself, points to an acute flare-up of the original condition: four cases followed swimming, four cases followed tonsillectomies, and four cases followed submucous resection of the nasal septum, one case followed an injury to the mastoid region, which also was a secondary operation; and one case which was part and parcel of a generalized septicemia.

In discussing the question of an otorrhea, we usually obtained a history that an aural discharge had been present for from one to two weeks and had stopped for a few days, when there was a subsequent flare-up, with the character of the pus changing and the more definite clinical symptoms of mastoiditis developing. The above held true in a great percentage of our cases, except when we were in the midst of an epidemic of an acute infection, such as the measles in the spring of 1928, or the influenza in the fall of 1928. At this time the entire picture of mastoiditis was altered; that is to say, the type of onset, the type of infection, the findings on myringotomy, the course of the mastoid infection, the operative findings, the convalescence and the ultimate results. These factors will be discussed later at greater length. These acute infections always play an important role in the incidence of secondary mastoiditis. It was noted that wherever we had an epidemic of either an acute infectious disease or of universal colds there was generally a marked flare-up of secondary mastoiditis following in its wake. It also appears that most of our cases of mastoiditis seem to follow in regular waves, and principally at certain times of the year. While we may have a sporadic case appearing in between seasons, as you may term it, the preponderance of mastoid infection occurred in two periods, the lesser in the early winter, while the greater occurred in the early spring, usually on the heels of the acute infectious diseases. This was particularly noticeable, when, in the late fall of 1928, we had another epidemic of influenza, the influx of mastoid cases came much earlier than usual.

Symptomatology: The usual symptoms prevailed in our cases. There was the group of cases which presented the classical symptoms—a profuse discharge from one or both ears, elevated temperature, pain and tenderness, postauricular swelling, usual systemic manifestations of an acute intoxication,—leukocytosis and polymorphonucleosis, X-ray findings of haziness, blurring, necrosis or softening, or cavity formation, and impairment of hearing. On the other hand,

there have been considerable departures from the above and we often did not have the entire picture as outlined. Occasionally we operated in the absence of a discharge, which may have been present, but recently had stopped; in the absence of an elevated temperature, in the presence of an apparently normal blood picture, or finally, a negative X-ray report. One or more of these findings may have been absent, but the rest of the clinical picture suggested operation, and we were always vindicated by our operative findings. A few cases were operated upon because of the presence of an existing facial palsy, and in two cases a Gradenigo syndrome. In addition, there was a certain group of infants that were either marasmic or who had a history of gastrointestinal symptoms with aural findings that were more or less indefinite, and in which following the operation there was a complete clearing up of all systemic symptoms. One of us (Coates¹) discussed this subject in detail, and there were a few of these cases in our series. We will cite but one—that of an infant of eight months, who, when two weeks old, had a pyloroplasty performed and up to the time of admission still persisted in a regurgitation of its food with the concomitant typical evidence of marasmus and malnutrition. The aural findings were indefinite at the best. The X-ray examination was inconclusive but Dr. M. S. Ersner performed a bilateral mastoidectomy. One side showed a small amount of pus present, with an edematous, congested mucous membrane on the opposite side. A few days later, the child began to retain its nourishment and, even though in the course of its convalescence an abscess in the abdominal wall was formed, this did not prevent the infant from becoming cured of its gastrointestinal symptoms and, on discharge, it began to look like a human being. Two years later the child was seen and appeared perfectly normal and thriving.

To return, let us look at the picture of some of these cases that were operated upon. We found on admission that about 20 per cent had had anywhere from one to four myringotomies performed. On the other hand, the balance of the group either had a spontaneous perforation, or there was no aural discharge present. The discharge was a variable factor. As mentioned above, in certain groups of cases this was of a certain type, which persisted for from several days to several weeks. Then it would stop suddenly, and would recur a few days, or a week later, but differing not only in quantity of the discharge but also changing its appearance and its character. The character of the discharge often depended on the type of organism at fault, and was also frequently altered in its consistency by the

presence of an acute Eustachian catarrh. Generally considered, a discharge was usually present at some time or other in most of our cases. However, in the few cases where this was not present, there were other clinical symptoms that guided us in the course of treatment, as, for instance, marked swelling, either postauricular or in the zygomatic region; severe pain, or the narrowing of the canal, X-ray findings, etc., I will repeat, that probably in from 90 to 95 per cent of the cases there was a definite previous discharge from the ears. A comment at this point concerning our findings on myringotomy or spontaneous rupture as the case may be. There had been a certain number of cases that were admitted with bulging of the eardrum, which, on incision, presented the ordinary purulent discharge. This, however, did not hold when we were in the midst of an epidemic of some type or other. Then the findings differed, depending on the organisms present, as for example, in the influenzal epidemic of 1928. All that was found on primary myringotomy was a profuse, bloody discharge, which in a few days became purulent.

A consideration of the temperature curve of these mastoid cases showed that, on admission, it ranged anywhere from 98.3° to 104° , but, on the whole, it averaged between 100° and 101° . This question of the presence or the absence of an elevation of temperature is a subject of only relative importance. We have seen cases where there was all the evidence of surgical mastoid, yet a study of the temperature record for several days showed only a normal picture. On the other hand, a marked elevation of temperature did not necessarily indicate either an extensive process present nor the severity of the diseases. Our feeling is that the temperature curve is far more important diagnostically in the convalescent period, especially a few days after the operation, rather than in the preoperative period. Here, unquestionably, it is one of the most definite indicators of any complications that might arise.

On the other hand, where we have a markedly elevated temperature, postauricular edema, and a probable perforation of the cortex, we feel that this was usually an indication for an emergency operation.

Another rather constant finding is the presence of pain over the mastoid region. Usually in about 80 to 85 per cent of cases, pain or extreme tenderness was present at either one or all of the three classical points—over the antrum, at the tip, or over the emissary vein. In some few cases there was pain and tenderness anteriorly, over the zygomatic region. This may possibly have been due to a secondary infection in the external auditory canal, but was more

likely due to involvement of mastoid cells extending into the zygomatic root.

There also were present in many cases other local symptoms, such as a post-auricular swelling and sagging of the posterosuperior wall, thickening of the periosteum behind the auricle, facial palsy, lateral headaches or impairment of hearing. The X-ray has been a considerable help in a large proportion of cases. Of course, there have been a number of cases that have been operated upon purely on clinical findings without X-ray plates having been taken. Wherever the pictures were taken, it was usually easy to correlate our operative findings with the X-ray reports. Yet, again, there were some indefinite or negative X-ray plates where clinical symptoms suggested a necrosis or cavity, which was confirmed at operation. Clinical evidence, therefore, ruled our opinion as to whether or not operation was done. This evidence did not depend on either any one or all of the symptoms being present, or on positive or negative X-ray reports, for we occasionally operated even in the absence of some of the so-called pathognomonic symptoms.

It is well to discuss the question of blood count at this point. A glance at Table V will give a direct picture of the cases that fall

TOTAL LEUKOCYTE COUNT.

		Simple		Bilateral	
6-7000	8	3.4			
7-8000	8	3.4			
8-9000	15	6.5			
9-10000	12	5.0	1	2.4	
10-12000	36	15.4	6	14.7	
12-14000	45	19.3	2	4.8	
14-16000	36	15.4	6	14.7	
16-18000	22	9.4	4	9.8	
18-20000	20	8.6	4	9.8	
20-25000	19	8.5	11	26.8	
25-30000	8	3.4	2	4.8	
Over 30000	4	1.7	5	12.2	
Total	233	100%	41	100%	

TABLE V.

under the various blood count groups previous to operation. It can be seen from this that about 50 per cent of the cases had a white blood count ranging anywhere between 10 to 16,000. The bilateral cases naturally showed a higher count. Our feeling is that where there was a blood count of over 18,000 there was either a lack of localization, or, on the other hand, a marked body reaction to infection. The operative indications in this work usually followed the same deduction made by Dr. M. S. Ersner², that is, that it was pref-

erable to wait until there was some evidence of localization, especially as evidenced by lowering of the total leukocyte count and an increase of the polymorphonuclear cells.

In 259 cases that were studied from the point of polymorphonucleosis, Table VI shows the relative distribution of cases. The poly-

POLYMORPHONUCLEAR COUNT.		
30-40	6	2.3
40-45	5	2
46-50	6	2.3
51-55	12	4.5
56-60	22	8.5
61-65	39	15.2
66-70	42	16.2
71-75	38	14.5
76-80	49	19.
81-85	28	11.
86-90	12	4.5
	259	100.0

TABLE VI.

morphonuclear count seems to be of especial interest as an indicator as to when to operate, for where there is a lowering of the hemoglobin and an increase of the polymorphonuclear count, especially in the presence of a hemolytic streptococcic type of infection, one should not wait, but operate at once.

Operative Findings: Most of the operations were usually done under a general anesthetic of either nitrous oxid and oxygen gas, or a combination of this with ether, or ether by the open drop method. There were 24 cases in this series that were done under local anesthesia, *viz.*, 23 were simple single, and one was bilateral; four because of diabetes, two of tuberculosis, one was senile (73 years), and 17 for no definite reason that can be deducted from the history, other than perhaps for demonstrative purposes for the graduate students, and because of coincidental bronchitis or other respiratory tract infections.

The usual classical postauricular incision was made and the operative findings varied from the acutely edematous, congested mucous membrane, cavitation at one point or another, general necrosis of the entire cavity, necrosis and destruction of the sinus, or the dural plate, or perforation of the tip with extension of the infection to the soft tissues of the neck in the form of Bezold's abscess.

In attempting to determine the bacteriology in these cases, cultures from the mastoid were positive only in 162 cases; in the balance they either were sterile, were contaminated, or none were taken. As in all similar studies, the streptococcus was the most frequent culprit.

ORGANISMS FROM MASTOID CAVITY.

Streptococcus Hemolyticus	79	Pneumococcus III	16
Streptococcus Pyogenes	6	Micrococcus Catarrhalis	3
Streptococcus Nonhemolyticus	16	Diphtheroid B.	4
Streptococcus (Undifferentiated)	11	B. Coli	1
Staphylococcus Albus	18	B. Proteus	1
Staphylococcus Aureus	7	Total	162

TABLE VII.

There is a rather interesting observation at this point. There is no question as to the pathogenesis of this list of organisms, and it has often been seen that the various organisms may run in special waves with, of course, the streptococcus hemolyticus predominating. It is also a fact that there seems to be a certain amount of infectivity and contagiousness of the organisms to those who come in contact with the patient; as to whether it be a contagion of one form or another is something that should be considered. It was observed that where one member of the family was infected with a certain organism, other members of the family were also susceptible to this infection. It is interesting to note from our records that there have been two sets of twins that were admitted to the hospital. In each case both were admitted either at the same time or a few days apart. Both had a similar infection, bilateral mastoiditis, both children of each set had almost identical operative findings, not only in the pathology present, but also in the fact that the organisms recovered in both cases were of the same strain, *i. e.*, the streptococcic hemolytic organisms. There have been any number of cases of children of the same family who were operated upon approximately at the same time. Apparently one child becomes infected from the other. These two cases of the twins were very impressive, because each pair of twins were at the hospital at the same time, their convalescence ran an almost identical course, and they were discharged from the hospital on the same date in each case.

The type of closure of the wounds varied. In about 50 per cent of the cases there was used the modified blood clot method. This method was to insert a small cigarette drain into the antrum and permit this to stand out horizontally, allowing the wound cavity to fill with blood, and sew up the wound tight except at the upper end, where the drain emerged. This method was used particularly during the usual run of cases. However, where there was a virulent type of infection, or during an epidemic of some sort or other, it was found that this method did not hold so well and the wound broke down, usually only partially, and consequently experience has shown that it was best to resort to the use of a small piece of iodoform drain inserted into the antral cavity. The findings ordinarily in these series of cases are comparable to those previously experienced either

by Coates or by Ersner²; that is, about 60 per cent of cases healed by primary union. There is to be noted that in this list we find that no one organism was the cause of the breakdown of the wound. Now, as to whether it is the lowered resistance or increased virulence of the organism, or whatever the cause may be, it is something other than the type of the bacteria themselves. I will repeat here from Ersner's deductions, that there are a definite number of cases that have broken down even when the culture from the mastoid wound was sterile. It seems that there is a better chance for primary union with the blood clot method of closure where there is the afebrile, coalescent or cavity formation type of mastoid; even in those cases where we have the marked postauricular edema, or a perforation of the cortex, and especially where the total leukocyte count is coming down and the polymorphonuclear count going up.

The convalescence usually ran a relatively similar course. The majority of the patients remained in the hospital for from four to 10 days after the operation. Where the patient remained longer than two weeks following the operation it was usually due to some complication.

In Table VIII there has been listed a number of coincident com-

COMPLICATIONS OR COINCIDENCES OF MASTOIDECTOMIES.	
Exposure of Lateral Sinus and Dura.....	59
Extradural and Perisinus Abscess.....	20
Bezold's Abscess	10
Brain Abscess	18
Facial Paralysis	10
Meningitis	12
Sinus Thrombosis	9
Erysipelas	9
Pneumonia	7
Post Cervical Adenitis	5
Diabetes	4
Otitis Media of the Opposite Side.....	3
Cancer of the Parotid.....	1
Positive Fistula Test	3
Measles	1
Pregnancy	1
Multiple Arthritis	1
Peri Rectal Abscess	1
Prolapse of the Rectum.....	1
Pulmonary T. B.	1
Mitral Stenosis	1
Pericarditis	1
Septicemia	2
Rickets	2
Diphtheria	2
Epidemic Encephalitis	1
Exposure of the Facial Nerve	2
Gradenigo Syndrome	2
Abscess in the Epigastrium	1
Total	190

TABLE VIII.

plications that were associated with our cases. All of these factors, probably with the exception of the 59 cases where either the lateral sinus or the dura, or both, were exposed during the course of the operation, played some part in prolonging the stay of the patient in the hospital. In 20 of the cases it is interesting to note that there was either an extradural or a perisinus abscess that was found at the time of operation, that was not recognized prior to going to the operating table. There were nine cases of erysipelas of the scalp and about the mastoid wound following the operation. The majority of these nine cases seemed to occur at about the same time. This may probably have been due to either carelessness during the dressing or contamination from one patient to another.

Results: Of our entire series of cases, we had but 29 deaths on this service.

While some of the cases in Table IX do not truly belong to our

CAUSES OF DEATH IN ASSOCIATION WITH THE MASTOID CASES.

Brain Abscess	14
Meningitis	7
Sinus Thrombosis	4
Bronchopneumonia	1
Septicemia	1
Encephalitis	1
Carcinoma of the Larynx.....	1
Total	29

TABLE IX.

series of simple mastoidectomies, the majority of them can be termed the unfavorable end-results. Some of these cases were only in the hospital one or two days prior to death; others ran a more prolonged course. The case of carcinoma of the larynx came in because of ear symptoms, and while in the hospital a diagnosis was made of carcinoma of the larynx, and the patient died suddenly a few days later.

As can be seen from this list we are not attempting to discuss the complications in this paper. They will be discussed at a later date.

Conclusions: We have tried to give a comprehensive study of a rather active service of Dr. Coates and his staff. The summary of these cases is interesting because of the emphasis on certain of the earlier concepts, and also because of the number of interesting incidents associated with such a series of cases as can be gleaned from the above study. First, we have the group of cases that may be termed "classical" in their associated symptoms; secondly, the group

of cases that may be termed atypical because of the absence of some of these so-called "classical" symptoms; thirdly, the influence of epidemics on the course of both the infection and the convalescence of some of these cases; fourthly, the ultimate end-results where there were but 29 deaths out of 644 patients, or about 4.5 per cent, that came on the service. This, of course, represents all cases considered.

I want to take the opportunity at this time to express my appreciation and thanks both to Dr. Coates and to Dr. Matthew Ersner for not only the privilege of the use of their material in the compilation of this report, but also their invaluable assistance both in their suggestions and in the formulation of this paper. I want also to give special thanks to Dr. Ersner for his kindness and assistance, and who pointed out many of the significant deductions noted in this paper.

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STUDIES IN BONE CONDUCTION.

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When the bones of the skull are set in vibration by an activated tuning fork, or by any other body which is capable of imparting its vibrations to the cranium, these vibrations reach the labyrinth by three routes: 1. By the bones directly transmitting their vibration to the internal ear (cranial conduction); 2. by the bones imparting their vibrations to the greater and lesser tympanic membranes and to the ossicular chain and through these carried into the labyrinth (cranio-tympanic conduction); and 3. by the bones imparting their vibrations to the air contained in the middle and outer ears, and this resonating air in turn acting upon the two tympanic membranes and the chain of ossicles terminating in the stapedian footplate, and thus reaching the perceptive apparatus (cranio-pneumo-tympanic conduction).

1. The vibrating bones cause resonance in the air contained in all the cranial cavities. 2. The intensity of sound thus produced is directly proportional to the volume of air set in motion. 3. *Cross-vibration*: In normal hearing, when the external meatus of one ear is occluded by the finger, the palm of the hand, or any other foreign body (but preferably by the palm), the sound of a vibrating tuning fork will be heard best when the stem of the fork is set over the mastoid antrum of the opposite side. 4. *Trans-vibration*: In normal hearing, when a vibrating fork is set anywhere on patient's skull, and the ear tips of a diagnostic tube are inserted into the ears of the examiner and examined respectively, the fork-sounds will be heard not only by the patient but also by the examiner. Furthermore, the sound will be heard best by the examiner when the fork is placed at either mastoid, from that side through which the patient hears it best.

The truth of the above stated propositions is attested, both objectively and subjectively, by the following experiments:

1. *a.* Insert one of the ear tips of a diagnostic tube in either ear and place the handle of a vibrating fork anywhere on the skull. The fork-sound will be lateralized to the ear containing the ear tip. Now place the other end of the tube into the mouth and close the lips around it (care being taken not to obstruct the opening in the oral extremity of the tube, with the tongue or any other structure of the buccal cavity) and immediately the sound in the ear, con-

Editor's Note—This ms. received in Laryngoscope Office and accepted for publication Jan. 18, 1930.

nected with the mouth by means of the tube, will become greatly augmented, due to the air set in vibration in the oral cavity reinforcing and thereby intensifying the sounds perceived through the cranial bones. *b.* Set the vibrating fork on skull, insert one ear tip in either ear and the other tip put into the mouth, closing the lips around it, and obstructing the opening with the tip of the tongue. When the sound of the fork is no longer audible, release the opening at the end of the tube, and the sound again becomes distinctly perceptible. *c.* Replace one of the ear tips with a large-size nasal tip and insert the latter in either ear, and the aural tip place in the mouth. It will be found that the sound is heard longer and louder than when an ear tip is used both in the mouth and ear.

2. *Trans-vibration (monaural):* *a.* Insert one of the ear tips in either ear and the distal end insert into either ear of the subject. Place a forcefully vibrating fork on the subject's skull. The fork-sound will be carried by means of the linking tube, from the patient to the examiner. *b.* Insert one of the tips into your ear canal and the other place into the patient's mouth, requesting him to close the lips about it, and the sound will be heard with greater intensity. The same result can be obtained by substituting, for the distal ear tip, a nasal tip and introducing it in either nostril of the patient, or by replacing the distal tip with an Eustachian catheter and introducing it, through a preformed opening, into the maxillary antrum.

3. *Trans-vibration (binaural):* *a.* Two similar tubes are used. Put an ear tip of each tube in your own ears and those of the patient, respectively. Set a vibrating fork on patient's midskull. If the ear tracts of the examiner and examined are normal, the fork-sound will be trans-vibrated with equal intensity to both ears of examiner. *b.* Replace one of the distal ear tips with a nasal tip and introduce both tips in patient's ears. Now the examiner will hear the sound better in the ear, connected by the tube, with the nasal tip. *c.* By using two nasal tips, one going to the subject's nostril and the other to his ear, the sound will be lateralized to the examiner's ear which is connected with the patient's nostril and, likewise, if one tip is placed into the subject's mouth and the other in his ear, the sound will be lateralized to the examiner's ear which is connected with the subject's mouth.

4. *Cross-vibration:* When the palm of the hand is gently pressed against one ear the sound of a vibrating tuning fork will be heard from the opposite mastoid better than from any other position on the skull. When a large nasal tip at one end of a diagnostic tube is introduced into either one of the patient's ears and the aural tip at the other extremity, inserted into the examiner's ear, both examiner

and examined will hear the sound better when the fork-stem is placed over the opposite mastoid antrum; on the other hand, when the distal end is placed in the patient's mouth or nostril the fork-sound will best be heard from the vertex.

In performing these experiments all the forks from 32 to 1024 inclusive may be used, but the best results will be obtained by using the four higher denominations, and in some of the tests, forks 512 and 1024 will serve best.

From the experiments detailed above, it becomes manifest that when the skull is set in vibration by a tuning fork, these vibrations are transmitted to all the cranial cavities, namely, the aural, mastoidal, buccal, nasal and sinal. That the intensity of sound thus produced depends upon the volume of air set in motion in these cavities. That the sounds of forks when applied to the skull tend to travel in a diametrically opposite direction from the site of application.

The foregoing may have a significant clinical bearing on the function of audition. Since resonating bodies tend to reinforce sound, it would follow that any interference with the process of resonance, such as pus, tumors, thickening of the lining membrane in the aural, mastoidal, nasal or sinal cavities, thereby encroaching on the enclosed air spaces contained therein, would tend to lessen the intensity of sound and, conversely, the removal of such interference or the increase of resonance in the same cavities would tend to augment the intensity of sound.

That this is the case is partially attested, in the case of air conduction, by the impairment of hearing consequent upon the narrowing of the lumen of the external auditory canal, by whatever cause. This diminished sound perception is not altogether due to interference with sound conduction, but also to decreased resonance in the affected ear by the lesion or the foreign body encroaching upon its air space. And in the case of bone conduction, by the better or prolonged bone conduction consequent upon the palm test, as compared with the finger test, and also proved by the preceding experiments. These tests will be discussed in detail later, but for our present purpose, suffice it to refer to the well known fact that when a finger is introduced lightly into a normal ear canal the bone conduction on that side becomes enhanced, but instead of the finger in the ear, the palm of the hand is lightly pressed against the ear, the bone conduction on that side will become still more increased, so much so that when the finger is placed in one ear and the open palm against the other the sound of a vibrating fork, set anywhere on the skull, will invariably be lateralized to the side of the palm.

The difference of sound perception on the two sides follows the difference of air volume set in vibration in the opposite ears. When the ear is covered by the palm none of the space in the ear canal is encroached upon, hence a greater column of air is set in motion; therefore, we get increased resonance—greater bone conduction. On the other hand, when the finger is introduced into the canal much of the space is cut off, hence a greatly diminished column of air is set in motion; therefore, we get lessened resonance—diminished bone conduction, *i. e.*, as compared with the palm test.

B. Weber's Test; Finger Test; Palm Test: In most textbooks on otology it is customary, when discussing Weber's test, to include in conjunction with it a consideration of the finger test. The reason for this being the assumption that these two phenomena are dependent on the same underlying principle, both for their causation and their mode of operation.

Before proceeding with the comparison of these, it will not be amiss to define or briefly describe these tests and also include the palm test.

Weber Test: In unilateral conductive lesions or in bilateral lesions where the pathology greatly predominates on one side, the sound of a vibrating tuning fork, when brought in contact with the midline of the skull, will be heard better in the affected ear in monaural conditions, or in the worse ear in binaural lesions.

Finger Test: In bilateral normal hearing, when one ear is occluded by a finger and the stem of a vibrating fork is placed anywhere on the skull the fork-sound will invariably be lateralized to the side thus occluded.

Palm Test: In binaural normal audition, when the palm of the hand is lightly pressed against either ear, the sound from a vibrating fork set anywhere on skull will decidedly be referred to the covered ear.

In both the finger and palm tests, the most pronounced results will be obtained when the fork handle is set over the mastoid antrum of the opposite ear from the one tested.

Politzer, in *Diseases of the Ear*, 6th Edition, states, in connection with the finger test phenomenon, that the increased bone conduction is due to: 1. Increased resonance in the external meatus; 2. reflexion of the sound through the cranial bones to the air in the auditory canal and thence to the drum and ossicles; and 3. to altered tension in the membrana tympani and ossicular chain.

Dench (*diseases of the Ear*, 5th Edition), in explaining the Weber test, states: "The experiments of Sieberman demonstrate that an increase in the labyrinthine pressure prolongs bone conduc-

tion. We should expect, therefore, to find a prolongation of the interval during which the membrane is depressed inward. In some conditions the reverse is true."

As will be observed from the quotations, Politzer does not attempt to explain the phenomenon of increased bone conduction consequent upon conductive lesions directly, but does explain the prolonged bone conduction following the introduction of the finger in the external ear canal. This explanation evidently is intended to cover both phenomena, but since part one and two of the explanation are operative only when the ear canal is converted into a closed cavity, as by the occluding finger, there remains only the third factor common to both tests, namely, altered tension of the drum membrane and ossicles.

Dench, on the other hand, does not explain the increased bone conduction due to the obstructing finger, but, on the strength of Sieberman's experiments, concludes that the augmented osseous conduction in obstructive lesions of the middle ear is due to increased tympanic and labyrinthine tension. But since the finger inserted into the external meatus produces the same result, namely, augmented intratympanic and intralabyrinthine pressure, it follows that both phenomena are covered by the same explanation.

Kerrison (*Diseases of the Ear*, 2nd Edition), in discussing the subject, states: "The explanation of the increase in hearing by bone conduction in tympanic disease proper is not altogether clear," then he goes on quoting Bezold's hypothesis, which, in essence, assumes an alteration of tension in the fibres of the annular ligament (produced by pathologic changes in the tympanum), which interferes with the transmission of air-borne waves, but favors the propagation of sound waves reaching the inner ear through the cranial bones. Continuing: "This theory, while not wholly convincing, is as satisfactory as any yet advanced, so far as the writer knows. It does not, however, satisfactorily explain the increased hearing by bone conduction which occurs when the ear is closed by a finger lightly placed in the auditory meatus. This phenomenon, in the author's opinion, is better explained as follows: In hearing by bone conduction part of the force of the vibrations thus transmitted is expended upon the column of air in the auditory meatus and thus conveyed outward and dispersed through the medium of the surrounding atmosphere. When, however, a finger is introduced into the orifice of the meatus, this canal is converted into a closed cavity, and constitutes a resonance chamber, in which the sonorous vibrations are collected and thrown back upon the drum membrane to augment those transmitted directly from the cranial bones to the annular ligament and the footplate of the stapes.

"That the increased perception of sound is brought about by the walls of this artificially closed cavity acting as resonators, and not by the compression of the contained air, is shown by the fact that the sound is heard loudest when the finger tip is placed lightly in the meatus, and is reduced when the finger is placed deeply in the canal so as to produce condensation of the enclosed air."

These paragraphs are quoted at length because the author is wholly in accord with the views expressed therein and, furthermore, they are substantiated by the experiments detailed in the first part of the paper.

Since the finger and palm tests have everything in common, they will be grouped together when comparisons are made between the finger and Weber's phenomena.

The finger and palm tests differ from Weber's in the following essential respects: In the former the best results are obtained when the vibrating fork is brought in contact with the opposite mastoid antrum from the one tested; in the latter the best result is obtained when the fork handle is placed on the midline of the skull. In the former any fork from 32 to 1024 inclusive will give accurate data, especially when used over the opposite mastoidal antrum; in the latter fork 128 or 256 is recommended for best results. In the former the lateralization is invariably uniform and definite, especially so with the palm test; in the latter it is not always positive. The former is produced by the conversion of the ear canal into a closed cavity, as so aptly described by Kerrison; the latter is produced, in the author's opinion, by a compensatory hypersensitivity of the cochlear apparatus.

That the Weber phenomenon is not produced by either increased or decreased intratympanic and intralabyrinthine tension is proved by *a.* Kerrison's experiment; that is, when the finger is introduced lightly into the canal the sound is heard louder than when the finger is forced deeply into the meatus, thereby causing increased pressure; by *b.* Gelle's test; and *c.* by the modified Gelle's test, presently to be described, where decreased tympanic and labyrinthine tension produces a still greater reduction in sound perception when conveyed through the cranial bones.

The hypothesis of hypersensitivity of Corti's organ to account for augmented bone conduction in tympanic lesions is borne out by the following: In a person with a unilateral tympanic lesion when the sound ear is covered by the palm and a vibrating fork is placed on the midskull, the fork-sound will be lateralized to the covered ear. If, on the other hand, both ears are covered by the palms the sound will be perceived better in the affected ear. In this case both ear

canals are converted into closed chambers and both have the same volume of air.

It cannot be argued that the affected ear is doubly obstructed, because the palm pressed against the ears affords the maximum example of prolonged bone conduction. This hypothesis, furthermore, receives added confirmation in the observation of Gradenigo, as stated in Dench, 5th Edition, pp. 160-161: "Gradenigo has shown that lesions of the conducting apparatus do in some instances cause the auditory nerve to respond more easily to the galvanic current than under normal conditions."

C. *The Modified Gelle Test*: This consists in exhausting the air from the ear canal, so that a negative pressure is produced in the external, middle and internal ears. The vacuum thus created in the ear canal by rarifying the contained air by exhaustion causes the drum membrane to bulge out, pulling outwards the chain of ossicles including the stapedian footplate and thereby reducing the intratympanic and the intralabyrinthine tension.

The advantage of the modified Gelle consists primarily in the strongly positive results obtained by this method as proved by the author in a number of comparative tests carried out and, secondarily, in the greater ease of its manipulation.

For exhausting the air from the ear canal the following method is used: A soft rubber tube, about two feet in length, with rather thick walls, in one extremity of which a nasal or aural tip is inserted, is employed. Introduce the tip snugly into the patient's external meatus so as to preclude any seepage of air, and the open end of the tube (or a small piece of glass tube may be fitted into this end) taken into your mouth and by exerting suction, exhaust the air from the patient's ear canal.

In normal hearing, it will be found that the sound of a vibrating tuning fork placed on the midskull will be lateralized to the ear thus obstructed by the nasal or aural tip. In this test, it will be observed that strongly positive results (in that the sound from the forks will be greatly lessened) will be obtained. So much so is this true that the reaction to this test, when properly performed, is one of three varieties. In some the sound will remain lateralized in the occluded ear, but greatly weakened. In others lateralization will become doubtful or indeterminate. While in certain others the sound will definitely be shifted to the opposite side, especially when tested with a 128 or 256 fork.

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THE PHYSIOLOGY AND CLINICAL EXAMINATION OF THE STATIC LABYRINTH.*

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Randall, in speaking of the labyrinth, has said: "The acoustic function is limited to the cochlea, the static function is limited to the saccule and utricle, whereas the kinetic function is presided over by the three semicircular canals, and also probably by the saccule and utricle."

The saccule and utricle, comprising the otolithic apparatus, inform at every instant of the position the head occupies in space. This minute apparatus also detects movements up and down, as when riding in an elevator and movements in a lateral direction. Although not as important, or as readily tested as the semicircular canal system, it is of sufficient importance to merit careful study. This paper is concerned entirely with this subject.

The saccule and utricle are lodged in the vestibular cavity of the internal ear and are parts of a system known as the membranous labyrinth. *The utricle, much larger than the saccule, is lodged in the elliptical fossa and is in direct communication with the semicircular canals, above and behind, while in front it gives off its endolymph canal, which, merging with the endolymph canal of the saccule, forms the endolymphatic duct. The saccus endolymphaticus, as you remember, is situated on the endocranial face of the posterior surface of the petrous bone (Fig. 1). The otolithic membrane of the utricle consists of sustaining and sensorial cells, whose superficial extremities emit cilia. The cilia are in intimate relation with a gelatinous layer that contains the otoliths of the utricle. This gelatinous layer is called the lapillus and, according to Quix, occupies a definite position in relation to its underlying macula (Fig. 2). He describes this relation as follows:*

"Flex the articulations between the first and second phalanges of the fingers until the angle between the two last phalanges and the first, which remains in the plane of the palm of the hand, is 140° . The surface of the plane of the two last phalanges is a little less than half that of the first phalanx, and of the palm. The relation between the palms of the hands corresponds to that of the two parts

*Read before the New York Academy of Medicine, Section on Otology, Dec. 13, 1929.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication Jan. 31, 1930.

of the lapillus." The hands are held forward in supination, as pictured. This position of the sagitta must be remembered and will be referred to later in the paper. The axis of the two lapitti corresponds to the axis of the posterior semicircular canal, and is roughly parallel to the axis of the petrous bone (frontal plane).

The *saccul*e is much smaller than the utricle. It is placed *between the latter and the cochlea*. It communicates with the utricle, as stated above, by the *canal of the endolymph*. Anteriorly it communicates with the cochlea by the *tiny canal of reunion*. The saccul is lodged in the fossa hemisphere. It contains the *macule* of the saccul, which is *histologically identical* with the macule of the utricle. The otolithic membrane of the saccul is called the *sagitta*. The position of the two sagitta can be described as follows: *Flex the metacarpophalangeal joints to form an angle of 155°, cross the hands back to back. It is now evident that the two sagittas are roughly in the vertical plane. They are perpendicular to the long axis of the petrous bone and correspond somewhat to the axis of the anterior semicircular canal*. There is, therefore, a correspondence in position between the *lapillus* and the *posterior semicircular canals* and between the *sagitta* and the *anterior semicircular canals*. The angulation of the *lapillus* enables it to exercise a function corresponding to the *horizontal semicircular canals*, so the two otolithic organs correspond in position and function with the *three semicircular canals*. It is necessary to understand and remember the relative positions of the otolithic organs.

The physiology of the otolithic apparatus, like that of the semicircular canals, is based largely on theoretical consideration. *It is believed that this apparatus controls and determines the defense reactions in connection with the varying positions of the head in space*. These reactions occur when the head is stationary and are dependent on the relative position the head occupies in space. *They have nothing to do with the position the body occupies. The stimulation cannot be due to a movement of fluids, as with the semicircular canals, but must be the result of gravity. The only plausible method of stimulation is by weight. i.e., by the action of gravity on the sensitive-sensorial otolithic membrane. This weight stimulation would, of course, vary with changes in the position of the head, definite reactions occurring when the head is placed in certain definite positions. Such is the case. These facts have led to the two theories which attempt to explain how the stimulation takes place.*

The theory of Magnus holds that the excitation takes place through the traction of the cilia, influenced by the weight of the otolithic membrane when it is below the macule. In other words, the otolith

hangs by the cilia from the macule like a pendulum from a clock, and moves in various directions in accord with the movements of the head. This traction stimulation theory of Magnus is not as universally accepted as the pressure theory of Quix.

Quix believes that the cilia of the sensory cells does not form actual contact with otoliths, but that a *gleatinous cushion intervenes*; and that the *otolith*, when above the macule, *presses* against the *gelatinous cushion* and so influences the cilia of the sensory cells. According to Quix, therefore, the otolith must be above the macule to produce the stimulation (Figs. 1 and 3).

Recalling the relative positions of the otolithic membranes and applying the theory of Quix, we are able to understand theoretically the physiology of the static labyrinth. I shall endeavor to explain this. In the first place, the two lapilli, being each in the same plane, act synergetically, regardless of the position of the head. On the other hand, the two sagitta, being at an angle to each other, are antagonistic to one another. The result is that when one lapillus is stimulated, the other is stimulated identically, and that when one is understimulated the same is true of its mate. In the case of the sagitta, when one is stimulated the other is understimulated.

To understand more clearly how this stimulation takes place we must observe what happens when an animal is turned about a horizontal bitemporal axis and then about a naso-occipital axis.

1. *Rotation About the Horizontal Bitemporal Axis:* At the beginning of the experiment, the head being upright, the lapilli lie above their macules and a definite pressure and a like pressure is exerted on each of them. Rotate the head 30° forward and the lapilli will lie exactly above the macule and the pressure and the stimulation will be at the maximum. Continuing the rotation forward, at 90° it will be apparent that the otoliths are in front of the macules and the pressure is nil. Continuing the rotation still further at 180° , the otolith, being below the macule, exert no pressure (the so-called blind spot of the utricle). Falling into space with the head upright or 30° forward causes the otolith to leave the macule and stimulation ceases. Descending in an elevator produces the same effect; whereas ascending, causing pressure of the otolith on the macule and increases the stimulation. These movements of ascending and descending, and of rotation about the bitemporal axis, stimulate the lapilli but not the sagitti. The lapilli, therefore, initiate the reflexes which occur when the head is displaced in the sagittal plane. It will be noted later that the induced reactional movements are likewise in the sagittal plane, i. e., flexion and extension.

2. *Rotation About the Horizontal Naso-occipital Axis:* When the head is upright the sagitta are almost vertical and parallel to the maculae. As a result the sagitta are but slightly affected in that position. Turning the head toward the left so the right side of the face is turned up and the left side down, will produce a stimulation of the right macule, and an understimulation of the left macule. When the rotation is continued to 180° the pressure on the two sagittae is almost nil. Further rotation again increases the stimulation. When the original upright position is regained it again becomes almost nil. It is not quite nil, however, because of the slight concavity of the sagittae.

The otolithic apparatus can be stimulated, therefore, when the head is immobile, or by the influence of motion, as riding in an elevator, or merry-go-round, or falling into space. It may also be stimulated by irrigation of the ear with hot or cold water, or by the galvanic current (Mygind).

Adrenalin: Remember that "the sagitta, the otolith of the saccule, controls movements in the frontal plane" (Baldenweck); and the lapillus of the utricle controls movements in the sagittal plane (S. S. F. and L. U. S.).

The effects of excitation of the otolithic apparatus are the same as those produced by stimulation of the semicircular canals, i. e., to produce sensations informing us of the positions of our heads in space to produce reactional movements in the eyes, limbs and trunk, and to produce organic disturbances, as vertigo, nausea, vomiting, cold sweats, etc. (Noulanquet). Little need be said about the sensations informing us of the position of our heads in space except that it is quite generally agreed that these sensations originate in the otolithic apparatus and are well assisted by the muscle, joint and other bodily senses. As regards the reactional movements, more should be said. We all remember that Ewald showed that total labyrinthectomy caused a loss of tonus of the opposite side of the body. Magnus and deKleyjne, Quix and others have further amplified these researches and from their work some theories and tests of the otolithic apparatus have been evolved. The first test is called "the counter rotation test of Barany." We all know that when the head is inclined to one side or other, or bent backward or forward, the eyes move naturally in an inverse direction. This compensation reaction is controlled by the otolithic apparatus and is disturbed where the latter is disturbed (Fig. 4). Barany has devised an apparatus too complicated for general use, that enables the observer to note with great accuracy the direction or displacement of the eyes in the various positions of the

head (see diagram). For highly scientific study this appliance is important, but the tests to be later described suffice for practical purposes.

The next test of the otolithic apparatus is called *the test of the vertigo and nystagmus of position*." To perform this test the head is placed in various positions. In typical cases of disease of the otolithic apparatus when some definite position is given, the head nystagmus and vertigo begin and continue until the head is redressed. They then cease at once but recur as often as the head is replaced in the abnormal position. In such a case if the entire body were made to partake of the movement given the head, the reaction would be the same, showing that it is of otolithic origin and is not dependent on muscle and cutaneous sensations. This test should be applied to all cases suspected of having labyrinthine disease. I have found it positive in acquired syphilis of the labyrinth in several cases. This has been observed by me in cases occurring during the secondary stage, and also in one case in the tertiary stage. In some of these dissociation nystagmus and Hennebert's sign of inverse fistula reaction were present. (On compression, nystagmus was to opposite side.) My experience has led me to believe that the vertigo and nystagmus of position is an important diagnostic sign of syphilis of the internal ear. I have not found any reference to this in the literature. The test will also be found positive in serous and suppurative labyrinthitis and sometimes in traumatic cases (Fig. 5).

We now pass to the test originated by Quix, which is a simple modification of the pointing test used in studying the semicircular canals. The modification consists in using the pointing test in a horizontal instead of a vertical direction to examine the lapilli. When the subject touches the examiner's finger, the lapilli are normal; when the lapilli are overstimulated the flexors predominate, as will be explained later, and the subject aims too low. When the lapilli are understimulated the extensors predominate and the subject aims too high (Fig. 6). The vertical pointing test is used for testing the function of the sagittae. If there is an overstimulation of the right sagittae the tonus of the abductors will be increased in the right arm and that of the adductors of the left arm which will result in past pointing to the right.

These tests, although extremely simple to apply, are very difficult to understand. I shall attempt to explain them. The explanation takes us back to the studies of Magnus and deKleijn. These observers noted that when an animal was picked up by the skin of the back and held in various positions a reflex resulted which always

brought the head back into the upright position. This is called the "righting reflex." The same observers noted the so-called "reflexes of posture" which are analogous to the "righting reflex." When an animal is placed in any position you please, a definite attitude will be assumed by the animal's trunk and limbs. This attitude will differ for each position selected. When the animal is *decerebrated* by the method of Sherrington the *righting reflex and reflexes of posture are absent*. This shows that these protective reflexes, or *reactional movements*, as they are sometimes called, are due to *labyrinthine stimulation and not to stimulation of other sense organs*.

Now, recalling the position of the lapillus and remembering that an increased tonus of this organ causes a predominance of the flexors, we understand the act of pointing too low in the horizontal pointing test of Quix (see Fig. 5). This test *should be applied with the head 30° forward* as that is the point at which the *stimulation of the lapilli is at its maximum*. It should also be applied with the head 130° back when the tonus is at its maximum and the action of the *extensors predominates*. Pointing high in the first case indicates paralysis of the lapilli; pointing low in the second case indicates a hyperexcitability of the lapilli. *Overstimulation of the lapilli causes flexion of the head, limbs and body, the eyes looking upward* (Fig. 7). *Understimulation of the lapilli causes extension of the head, limbs and body, the eyes looking downward* (see diagram, Fig. 8).

Now, recalling the position of the sagittae and remembering that an increased tonus of the *right sagitta* causes the right arm and leg to be abducted, we more readily understand the past point to the right. *Overexcitation of the sagitta causes abduction of the limbs and body on the same side, and adduction of the same on the opposite side*. The eyes are turned upward (see diagram, Fig. 9).

Assuming that the left sagitta is paralyzed, you would then expect the index finger to deviate inward for the tonus of the abductors has been diminished. This would occur even in the optimum position for stimulation of the left sagitta, *i. e.*, the head inclined to right (Fig. 6). Assuming that the left sagitta is overstimulated, the result would then be a deviation outward of the index finger, due to the increase of tonus of the abductors. This would occur even when the left sagitta is placed in its pessimum position (head inclined to left).

71 Park Avenue.

PERSISTENT NASAL HEMORRHAGE TREATED WITH RADIUM.*

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Nasal bleeding may be due to any one of several causes, either local or systemic. Among the local are trauma, direct or following operation, foreign bodies, and the various angiomas and neoplasms. It may also be a symptom in systemic conditions, such as hemophilia, arteriosclerosis, anemia, vicarious menstruation, scurvy, cardiac disease and some of the infectious diseases. In almost 90 per cent of cases of nasal hemorrhage the bleeding was found to come from the anterior lower part of the septum, known as Kiesselbach's area. This area is the site of the junction of the superior maxillary artery, called the anterior artery of the septum, and the ascending branch of the palatine artery with its numerous communicating branches. These form a plexus which bleeds on the slightest irritation or manipulation. The mucous membrane in this situation is so thin that the veins and arteries are superficial. The slightest injury is liable to open them and, as they cannot retract into deeper tissue, they bleed profusely.

Most cases of nasal bleeding are slight and usually cease spontaneously. When bleeding comes from trauma it is not always easy to locate the bleeding area, and in such cases packing the nares is usually satisfactory. My method of packing the nose consists of inserting a sterile rubber finger cot, previously smeared with vaseline, and then packing the finger cot with narrow strips of gauze until filled. This stops any hemorrhage and is easily removed the following morning without starting bleeding again. If bleeding comes from Kiesselbach's area it can be located by blanching the mucous membrane with a spray or packing of equal parts of 10 per cent cocaine and adrenalin, 1:1000. A metal applicator with a fused bead of chromic acid at its tip is usually sufficient to cauterize and stop the nasal bleeding. The galvanocautery, if at hand, can be used efficiently, also.

When the bleeding is frequent and comes from systemic conditions appropriate treatment must be given by the internist. A large percentage of nasal bleeding cases return with renewed bleeding at

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Editor's Note—This ms. received in Laryngoscope Office and accepted for publication Jan. 15, 1930.

frequent intervals. Constant packing and cauterization are eventually harmful. When the bleeding is due to angiomas or hemangiomas, which may spring from the septum or floor of the nose, radium is the only efficient treatment.

Radium applied in element form in the nares seems to have an effect on the mucous membrane. It produces a fibrosis at the site of application; and the fibrosis obliterates the blood vessels. It also probably affects the vessels themselves, so that after two applications they are obliterated.

Technique of Application: The nasal mucous membrane is first shrunk with solution of equal parts of 10 per cent cocain and adrenalin, 1:1000, to admit the element in its container without pain. A 25 m.gm. capsule, screened first with platinum and then with brass and covered with gutta percha tissue is inserted opposite the bleeding area and kept there from three to four hours. I found a dose of 75 to 100 m.c. hours to be sufficient in the average case. Treatment is repeated in from two to four weeks. A reaction frequently follows, but consists only in a slight redness and a scab formation at the area affected.

A number of cases receiving this treatment bled from the area around a perforation in the septum following submucous operation. The treatment here was completely satisfactory. None of the cases returned with further bleeding after an elapse of five years.

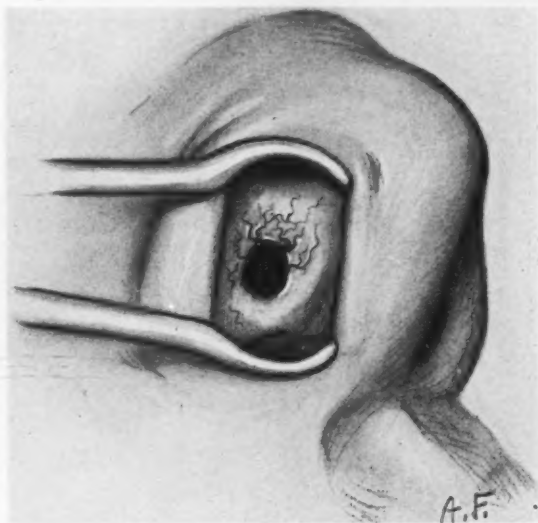
Case 1: F. M., female, age 42 years, previous and family history negative. The present history dates back to three years ago, when she had a nasal hemorrhage from the left nostril. From this time on at regular intervals of from one to three months, she had nose-bleed from either one or the other nostril, so that she had become quite anemic. The last hemorrhage was five days before examination.

Examination revealed quite an anemic patient with hemoglobin, 65 per cent, and red blood cells, 2,900,000. Coagulation time, five minutes, bleeding time, seven minutes. Nasal examination showed a reddish-looking septum. The anterior part of the nasal septum at both sides showed the blood vessels standing out prominently over an area about three-fourths inches in diameter. A small ulceration was present at the left side, while at the right side a small blood clot showed the site of the last bleeding.

The treatment consisted in the application of 25 m.gm of radium element screened in platinum, brass and gutta percha and allowed to remain $3\frac{1}{2}$ hours. A second application was given two weeks later, there being no bleeding in the interval. No reaction occurred.

This patient has been under my supervision for the past four years and since then has had no further bleeding; her health has returned to normal.

Case 2: L. S., a man, age 35 years, a printer, was referred to me for relief from continuous nasal bleeding. A nasal operation, evidently a submucous resection, had been performed about four years before I saw him. From that time up to about a year before admission to the hospital he has had constant bleeding from the nose. The present condition dated back six months. At that time he had a severe hemorrhage from the left nostril. The bleeding

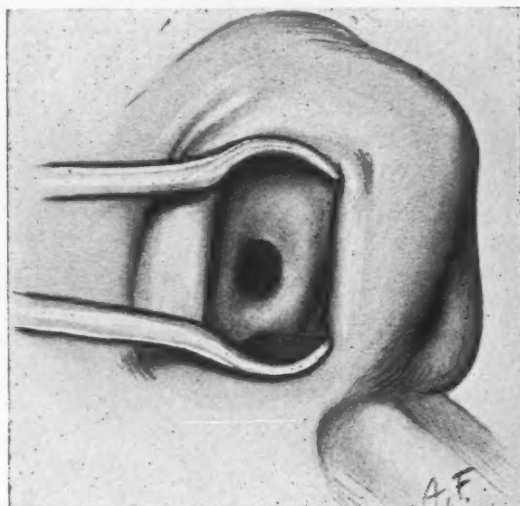


Case 5. Septum and perforation before application of radium, showing dilated blood vessels.

was controlled only after a large amount of blood had been lost. After this the nosebleed increased in frequency, so that at the time of admission the patient was weak and anemic. The last hemorrhage occurred Jan. 12, 1926. Examination, Jan. 17, showed the man to be anemic, and the nasal septum showed a large septal perforation at the anterior quadrant. There was some oozing from the posterior margin of the perforation, and the septum showed an area about 4 m.m. in length, covered with numerous small blood vessels, which bled on touch. A number of dilated and tortuous vessels

were present at the anterior parts of both sides of the septum. The inferior turbinate bone at the right side appeared to be exceedingly vascular at its anterior inferior margin, and several petechial areas were plainly visible. No sinusitis or other pathologic condition was present. It was interesting to note, in this case, the presence of numerous small, round and indurated petechial areas on the tongue. An examination of the blood showed a normal reaction of $4\frac{1}{2}$ minutes for bleeding time, and five minutes for coagulation.

The treatment consisted of three applications of 25 m.gm. of radium element in the form of a needle screened with platinum and applied to each side of the nasal septum for three hours. These



Case 5. Septum and perforation after application of radium, showing obliteration of blood vessels.

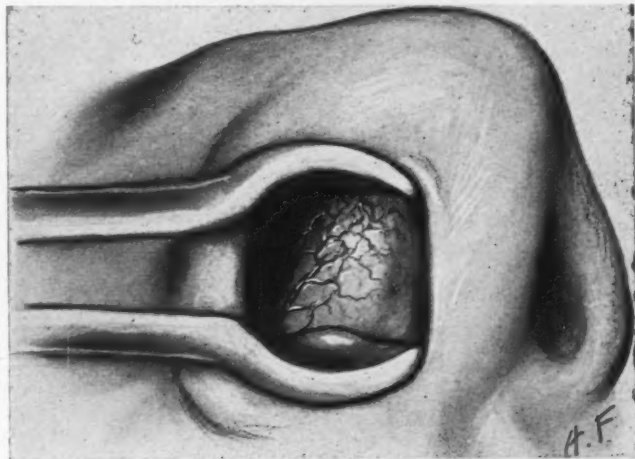
treatments were given on Jan. 21, Feb. 17 and March 10. No reaction followed. Bleeding ceased after the first treatment.

Examination three months after the last treatment revealed the margin of the septal perforation healed. The septum appeared blanched and all the dilated vessels had practically disappeared. Examination six months later revealed a similar condition; the patient had not had nosebleed since the treatemnts.

Case 3: In Mrs. A. C., a housewife, age 40 years, whose family and previous history were negative, the present illness dated back

to two years before admission to the hospital, when, without warning or cause, she had a severe nosebleed from the right nostril. This was followed by repeated nosebleeds from one or the other nostril, usually not alarming in severity. About two days before examination, she had a severe hemorrhage from the left nostril, which necessitated repeated nasal packing before it stopped.

Examination on April 1, 1926, showed a slightly flattened nose with a marked deflection of the septum. There was a large spur on the left side, which almost touched the base of the nose. There was a distinct ulcer present at the anterior part of the left side of the septum, which was undoubtedly the site of the nosebleed. The



Case 7. Septum before application of radium, showing dilated blood vessels.

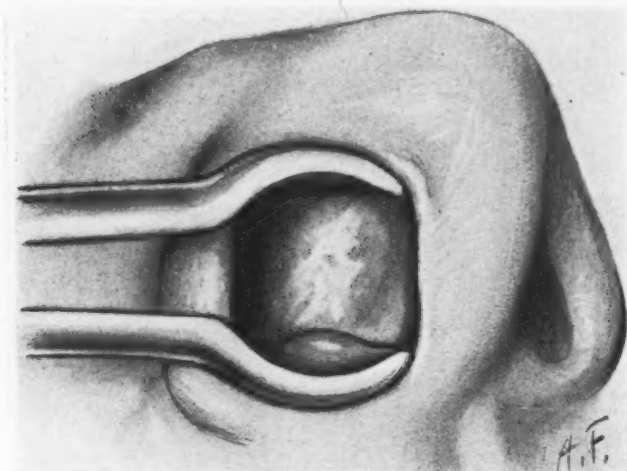
anterior parts of both sides of the septum showed a network of numerous blood vessels, some standing out distinctly, elevated and bleeding on touch. Where the spur on the left side of the septum took a sharp turn downward to the base of the nose the mucous membrane was extremely vascular and was probably the site of several previous nosebleeds. A chronic maxillary sinusitis was also present. This was confirmed by a Roentgenogram.

The treatment consisted of two applications of 25 m.gm. radium element placed in platinum needles against each side of the nasal septum for four hours. A slight reaction followed, and the patient

complained of a little pain on the tenth day. This, however, was not severe and lasted only one week. Bleeding did not occur after the first application of radium.

Examination of the nasal septum after three six-month intervals revealed a blanched nasal mucous membrane with all the vessels obliterated.

Case 4: F. F., female, age 22 years, family and previous history negative. Present history dates back to three years ago, when she commenced having nasal hemorrhages and bled on and off at irregular intervals. The bleeding was never alarming and always stopped



Case 7. Septum after application of radium, showing obliteration of blood vessels.

by itself until the last hemorrhage, five days ago. This had to be stopped by a physician. Examination (Dec. 20, 1927) of the nares revealed prominent and numerous blood vessels standing out definitely on both sides of the anterior part of the septum. These bled on touch of a cotton applicator. No other pathological conditions were present.

On Jan. 5, 1928, a 50 m.gm. capsule of radium, screened by platinum, brass and gutta percha was placed against the dilated blood vessels of the left side of the septum and allowed to remain two hours. No reaction followed. On Jan. 19 the right side was treated

similarly. On Feb. 23 the right side got its second treatment, and two weeks later the left.

No further bleeding ensued. No reaction followed. On May 5 she returned for examination, at which time I found closely adherent scabs on the parts of the septum radiated. She was last seen on Aug. 7, 1929. Examination did not show any prominent blood vessels in the septum. It appeared fibrotic and the patient has had no further nasal bleeding.

Case 5: E. N., age 74 years, previous history not important. Her present condition dates back to 15 years ago, when she commenced to bleed from the right side of the nose. This continued at various intervals until recently it had increased both in frequency and quantity. She has never bled from the left nostril.

Examination revealed a very anemic-looking individual, the right nares being occluded by a blood clot from a hemorrhage two days ago. Upon removal and cleansing the nares a small hemangioma was visible on the floor of the nares, about three-fourths inches from its opening and lying near the septum. Its size was that of a pea, and was of a dark red color and of soft consistency. This mass bled at the slightest manipulation. The blood vessels on both sides of the septum were somewhat prominent and dilated. It was thought advisable not to remove a section of the growth for pathological examination. After bleeding had ceased, a 25 m.gm. capsule of radium was inserted in the right nostril, exactly over the angioma, and allowed to remain for $7\frac{1}{2}$ hours. This was repeated in two weeks, there being no bleeding in the interval. There was some reaction, which acted like an acute nasal catarrh, otherwise it was not annoying. Two months later the angioma had entirely disappeared and for the past year this patient has had no further bleeding.

Case 6: R. F., age 64 years, previous and past history not important. Present complaint dates back to 10 years ago, when she commenced to bleed from the nose. This bleeding has been annoying her so that at that time she was bedridden. The last hemorrhage occurred 24 hours ago and was still bleeding at time of examination.

Examination of the nose revealed a large anterior perforation of the nasal septum, which was spontaneous, due to the constant bleeding and ulceration, and its attendant picking off of the scabs with her fingers. The entire area of mucous membrane around the perforation appeared very vascular, with the blood vessels standing out very prominently and bleeding on touch. She attributed the septal perforation to the numerous cauterizations of the septum with acid at each nasal hemorrhage.

The treatment consisted in the application of a 25 m.gm. radium needle, screened with platinum, brass and gutta percha tissue. This was applied to the right side of the septum, opposite the septal perforation, and allowed to remain for four hours. A slight reaction followed. No further bleeding occurred. She refused another application of the radium, but a year has elapsed and no further bleeding has occurred. She is still under my observation.

Case 7: G. S., age 19 years, previous history negative. Present history dates back to two years ago, when he commenced to have nasal hemorrhages at frequent intervals. Examination revealed the nasal septum considerably deviated, but not obstructed. On both sides of the septum, over Kiesselbach's area, the blood vessels stood out prominently and bled upon being touched with a cotton applicator. The bleeding vessel was cauterized with a bead of fused chromic acid and three days later 50 m.c. of radium were applied, first to one side of the septum and then to the other and kept there for two hours. This was repeated four weeks later. No hemorrhage occurred in the interval of treatment, and no further bleeding has occurred for the past year-and-a-half. He is still under observation.

CONCLUSION.

Persistent and repeated nasal hemorrhages can now be definitely and permanently stopped by the use of radium.

This treatment was commenced five years ago and over 100 cases have been treated. The results were very satisfactory, in that only one case returned, a year later, with further bleeding. This bleeding occurred from a different area of mucous membrane, which had not been radiated. Cessation of hemorrhage was prompt and certain even after the first application of the radium.

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HAY FEVER. ITS SURGICAL CONQUEST.*

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It has been generally supposed that a hay fever sufferer has only one case of the disease. The surgical approach was required to show that hay fever patients may, and indeed generally do, each present two separate and distinct cases: one on the right side, and one on the left, either of which may be promptly and completely relieved, while the other is left rampant.

The surgical control of hay fever came about through the development of a general interpretation of dysfunction and disease; by the application of this interpretation to pathologies of the nasal chambers, particularly to that group of associated dysfunctions which we call hay fever; and finally by the development of the surgical procedure which, according to this interpretation, was expected to give relief.

This general interpretation of disease, upon which the surgical control of hay fever is based, is known as the *theory of pathological currents*. While time does not permit us to go into the derivation of this theory from the facts out of which it arose, or to enter into any discussion of the evidence in its support, still some presentation of the basic concept is indispensable in order to make the surgical control of hay fever intelligible.

In brief, the theory of pathological currents postulates that efferent currents flowing out from the brain to motivate and stabilize the various functions, sometimes register in a given locus in excess, there engendering dysfunction, or pathology, the nature of which varies according to the nature of the tissues victimized.

We have it from physiology that there are efferent currents flowing out from the brain, and that these motivate and stabilize the various functions of the organism. Also, we have it from physiology that the transition from function to dysfunction is a quantitative one—that a state of disease, or dysfunction, comes about through too much or too little of some function (Sir Arthur Lovatt Evans). Moreover, among the most familiar of experiments in the physiological laboratory is the actuation of various dysfunctions by currents sent along the nerves in an efferent direction as the result of artificial stimuli.

Here, it will be immediately seen, physiology has prepared a syllogism leading to the conclusion that efferent currents in abnormal

*Read before the Detroit Otolaryngological Society, Nov. 20, 1929.

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Editor's Note: This ms. received in Laryngoscope Office and accepted for publication Feb. 7, 1930.

quantum initiate and motivate dysfunctions, and has even demonstrated the process in the laboratory. What mental obstacle prevented physiology from completing the syllogism can only be subject for the clinician's speculation. Indeed, it would have seemed the logical thing for the pure science of physiology to have gone even further, and pointed out to the applied science of medicine that dysfunctions are expected to be relieved by the interception of the efferent currents that actuate them. Had physiology done so, it would have performed a service to science not unlike that performed by Leverrier when he directed Galle, of Berlin, to train his telescope upon a certain spot in the skies, with the result that Neptune was discovered. Even so, however, though physiology failed to utilize this most magnificent opportunity of advancing the boundaries of knowledge, and even though the principle that dysfunctions are actuated by efferent currents had to wait until chance disclosed it in the clinic, still clinical medicine must acknowledge itself deeply indebted to physiology for the uncompleted syllogism, awaiting only the addition of a conclusion to interpret the results obtained in the clinic by the interception of nerve currents.

The theory of pathological currents, as applied to that group of associated symptoms, including excessive sneezing, that we call hay fever, postulates that these dysfunctions are the result of excess efferent currents (pathological currents), registering in the sneeze region, roughly the roof of the nasal chambers. A corollary of the theory of pathological currents is that the interception of such incoming currents will be followed by the cessation of this group of dysfunctions.

It was mentioned above that through the surgical approach it is found that hay fever sufferers usually present two separate and distinct cases of the malady, one on each side, either of which may be relieved while the other is left rampant. This discussion will be simplified if we now limit it to one side, say the left, with the understanding that the right is in all essentials a duplicate.

From any standard anatomy we learn that the trigeminal nerve has connections with the sneeze region over two routes, namely, via the superior maxillary and sphenopalatine ganglion on the one hand, and via the ophthalmic and the nasal nerve on the other. It would seem anatomically simple for excess currents coming down the trigeminal nerve to reach the sneeze region over either route. It will be recalled that physiology assigns to both the ophthalmic and superior maxillary nerves only sensory functions—an interpretation that in the light of these developments calls for re-examination. The arrest of hay fever accordingly resolves itself into the practical problem of blocking one or both of these two routes.

Long before the theory of pathological currents was formulated, it was discovered that blocking the nasal ganglion did have the effect of immediately and completely arresting some cases of hay fever, but by no means all, others being quite unaffected. Then, with the coming of the theory of pathological currents, the cause of the failures seemed to be apprehended—that in such cases the excess current had not been coming in via the sphenopalatine ganglion, but by some alternative route. Reference to anatomy then disclosing the nasal nerve as such alternative route, it was postulated that the control of hay fever would be completed with the development of a suitable technique for the interception of currents coming into the sneeze region this way. With a view to working out such a technique, the writer injected the nasal nerve where it dips down through the cribriform plate into the nasal chamber, resorting to this procedure in cases where blocking the sphenopalatine ganglion had failed to arrest the malady. A considerable percentage of cases, indeed, were found to be relieved by this supplementary procedure—such a large percentage, in fact, that for a time it was supposed that any failures were attributable to faulty technique in the injection itself.

The writer, being then located in Florida, without access to the facilities of an anatomical laboratory, had to depend upon admittedly crude methods in working out his technique for injecting the nasal nerve, such, for instance, as X-raying applicators in place in the nose. Apprehending that a technique derived in this way might not be very reliable, he submitted the problem to the profession, in an article published in *American Medicine*, March, 1928, under the title, "Pathological Currents and Hay Fever," in the hope that others, with anatomical laboratory facilities at their disposal, would work out a better technique.

Subsequently, the writer came north, where he could undertake the solution of the problem himself. With the accretion of data toward the solution of this problem, cases began to appear in which the sphenopalatine ganglion and the nasal nerve, at the point where it enters the nasal chamber, both seemed to have been thoroughly injected, and still the hay fever persisted. Minute and careful dissections now revealed a large number of fine filaments given off in the three-quarters of an inch proximal to the point where the nasal nerve had been injected. At once the interpretation suggested itself that the fault lay in making our injections too near the extremity of distribution.

For the sake of clarity, let us pause now to examine this three-quarters of an inch proximal, a section which the anatomies usually pass over with mere mention. To avoid confusion in nomenclature,

let us divide that branch of the ophthalmic which Gray calls the nasal nerve, into three sections, a first, a middle and terminal, calling the first, after Labat, the nasociliary; the middle after a German anatomist, the anterior ethmoidal; and the terminal, after Gray, the nasal nerve. The anterior ethmoidal foramen then, where the nasociliary nerve leaves the orbit, marks the point of transition from the nasociliary to the anterior ethmoidal nerve. Similarly, the point where the anterior ethmoidal nerve dips down through the cribriform plate beside the crista galli into the nasal chamber will mark the transition from the anterior ethmoidal nerve to the nasal nerve.

This middle section, this three-quarters of an inch, here designated as the anterior ethmoidal nerve, proving as it has, the key to pathologies in the nasal chamber, demands much closer attention than the anatomies have devoted to it. This three-quarters of an inch of nerve threads its way among the ethmoidal cells, instead of passing directly through a wall, as the anatomies lead one to suppose, and passing through the ethmoidal cells give off filaments which the anatomies at our disposal have quite overlooked.

If, indeed, the continuance of hay fever in the refractory cases encountered was attributable to pathological currents reaching the sneeze region via these filaments, then the problem of controlling hay fever resolves itself into stopping the leak by a more proximal injection.

The problem of injecting proximal to these filaments, at once suggested injecting the nasociliary nerve through the orbit at the point where it enters the anterior ethmoidal foramen.

In the language of Howell T. Pershing, "we naturally shrink from injecting alcohol into the orbit." Moreover, that same authority tells us that it is impossible to inject the nasociliary nerve through the orbit without damage. But since this route seemed the only solution, after careful dissection and measurements, and the establishment of external landmarks, it was finally ventured to inject a small quantity of alcohol (three minims) into the region of the anterior ethmoidal foramen, in a case where the eye had been lost through glaucoma. Not only did the control of nasal pathologies and hay fever in this case support our interpretation, but the region of anesthesia produced, including the whole half-forehead, showed an anatomical distribution not expected from the anatomies, and began to intimate the unexpected importance of the anterior ethmoidal nerve in nasal pathologies.

Even after this case, however, it was not without much consideration that any attempt was made to inject the nasociliary nerve beside a functioning eye, for it was realized that only the smallest amount

of alcohol could be injected into the orbit without inviting disaster, and that such a small amount, if it were to successfully block the nasociliary nerve, must be placed with the greatest exactness. The operation was not one to be attempted without the full realization that the margin between success and calamity was indeed a narrow one.

When the point was reached where there seemed nothing else to be done by way of preliminary preparation, or the establishment of safeguards, it was now ventured to inject three minims of 95 per cent alcohol with 1.5 per cent novocain into the nasociliary nerve in the orbit beside a functioning eye.

The pain incident to the injection, though sharp, was not unbearable, and, owing to the novocain, which of course went everywhere the alcohol did, producing anesthesia as it went. The pain all melted away in about 30 seconds, leaving the patient in a state of relative comfort.

The tissues about the eye began to swell in the next few hours, and by the following morning the eye was almost, but not quite closed. This condition continued something over 24 hours, and then, about 48 hours after the injection, receded rather abruptly. This succession of events, it may be observed, seems to be about the average expectancy.

The injection was made, in this particular case, for hay fever of seven or eight years' duration, originally seasonal, but which had lately seemed to lose reference to seasons almost entirely. Among the associate symptoms in this case were considerable rhinorrhea, which was causing excoriation about the nares, and some corking up of the nose. Almost immediately following the injection the rhinorrhea ceased, and about the time the swelling of the eye abated, the nose also opened up. When the patient was seen four days afterwards, the excoriation had disappeared, and the nose had opened up, so that the patient, so far as this side was concerned, was quite comfortable. In contrast, the symptoms on the other side were rampant as before. Indeed, the patient now presented a unilateral case of hay fever, or, to put it another way, she had been relieved of her right case of hay fever while the left remained undisturbed.

Four days after injecting the right side, the left was similarly injected, with a sequence of events, for all practical purposes identical, so that at the end of a week her malady had been relieved by two separate surgical procedures, each immediately effective and complete within its sphere.

A series of 33 similar injections reveals that the sequence of events follows that described above with a high degree of uniformity. In

cases of hay fever and rhinorrhea, the relief appears to be immediate and complete. In vasomotor and hypertrophic rhinitis, the relief is not so prompt, but after a period of 10 days to two weeks becomes very striking. In case of polypoid degeneration, the theory of pathological currents postulates good results, and so far this postulate has been confirmed, but the number of cases of polypoid degeneration is, at present, too limited to justify any predictions.

In two cases of the series, the nerve in question must have been missed altogether, for neither did anesthesia follow, nor was there any therapeutic benefit noted. In all others, both anesthesia and tangible therapeutic results were obtained. In one case of the 33, diplopia followed the injection, which is interpreted as a malplacement of the solution of alcohol and novocain, resulting in a muscular disturbance. But since the novocain anesthesia involves a greater radius than the alcohol anesthesia, it is hoped that this case, which at the present writing has not been seen since the injection two days ago, will be of short duration.*

Sufficient data seems now at hand to justify the assertion that in this procedure we have a surgical approach to hay fever which, in the hands of the trained operator, is safe, practical and effective. How long the relief will last remains to be seen; but should it last only a year, it would still be the procedure of choice in the treatment of this affliction. However, inasmuch as a number of cases have enjoyed several years' relief from merely injecting the sphenopalatine ganglia, a procedure based upon the same principles, but less uniformly effective, we are not without reasons for hoping that injection of the nasociliary nerve in the orbit will prove not only a safe and effective surgical approach to hay fever and pathologies of the nasal chamber, but also of some permanence.

In conclusion, it may be noted that the principle of efferent interception, here invoked in the control of pathologies of the nasal chambers, does not belong to the rhinologist alone, or indeed to any one specialty, but arises out of the theory of pathological currents. The principle of efferent interception has been invoked in the field of the ophthalmologist, the internist, the obstetrician, and particularly has it been invoked by the general practitioner. Because of the many anatomical problems, and problems of technique in these latter fields, however, efferent interception in the visceral regions and the extremities, although the subject of extensive observations, is still almost a virgin field for therapeutic application. It is the anatomical accessibility of both the sphenopalatine ganglion and the nasociliary

*This proved to be the case.

nerve, together with the fact that a practical technique has been evolved for the injection of both, that enables the otolaryngologist to make therapeutic avail of the principle of efferent interception with a precision which none of the other specialties can at present enjoy.

This principle has been invoked in other regions of the body in the arrest of sensory, motor, secretory, respiratory, circulatory and endocrine dysfunctions. Whatever therapeutic gains may ultimately be achieved through the application of this principle, in the larger regions of the body, medicine will always be indebted to otolaryngology for the disclosure of the principle and the demonstration of its striking therapeutic possibilities. Particularly is medicine indebted to that otolaryngologist who will always be remembered as the pioneer in this field of research, the late and lamented Dr. Greenfield Sluder.

But the therapeutic gains are not the only ones which otolaryngology seems destined to contribute. If the therapeutic principle of efferent interception be sound—if pathological currents exist in the organism, that is normal efferent currents distributed in excess, and if they cause dysfunctions in the organs or tissues they happen to victimize, and if it is such currents that we intercept when we block the ganglion and immediately arrest a chorea, a diarrhea, a hypertension, then efferent currents must play a more important role in the living process than we had supposed; our present physiological concepts must undergo modification and many changes of emphasis, and indeed the pure science of biology stands to receive no mean contribution from the applied science of otolaryngology, paradoxical as it may seem.

In reality, however, there is no paradox. The development of the principle of efferent interception by the applied science of otolaryngology has made available in the clinic a method of physiological research that is quite fairly comparable, in accuracy, with the methods of the laboratory. The clinic ceases to be limited to applied science, and becomes at the same time a field for pure science, a field for physiological research, and more broadly a field for biological research, because there is now available in the clinic, applicable to the living, conscious, human organism, undissected and intact, a method of investigation of life processes with a precision comparable to the microscope or the test tube in their respective fields. Whatever pure science may gain through the development of the clinic in biological research, it will always acknowledge its indebtedness to otolaryngology for opening the way.

SOME END-RESULTS OF TONSILLECTOMY, WITH SPECIAL REFERENCE TO SINUS INFECTION IN ADULTS.

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The purpose of this paper is to report the results of tonsillectomy in 108 adult cases on whom a diagnosis of chronic sinusitis was made.

I have been impressed by the close association of these two pathologic entities. It is reasonable to believe that tonsils may become infected by the purulent discharge from infected paranasal cells, even though there are no afferent lymphatics to the tonsil. By physical relations this pathogenesis can well be explained. The purulent contents of the sinus from above are constantly dropping down the lateral pharyngeal walls, and, during the acts of hawking, coughing and clearing the throat, the faucial surfaces of the tonsils are bathed in infective sinus secretion. This irritates and inflames the mucous membrane and admits bacteria into the open-mouthed crypts. Due to the lymphoid activity, the invading organisms and the cryptic debris already present, minute abscesses are formed from which absorption takes place.

It would hardly be feasible to believe that blood-born infections from the nasal sinuses would select the tonsil, any more than the articular surfaces of joints, the heart, the kidneys or the appendix. Theoretically, the tonsil could be infected through the bloodstream. The most reasonable explanation would be that of "locus minoris resistencia," which probably does have some bearing in this association. Given a sinus infection from which general absorption takes place, the resistance is so lowered that dormant potential foci, in good health, now under adverse conditions becomes active and tonsillitis results.

Now, if we turn this about and ask the question, "How does the infected tonsil affect the sinuses?" we will have the same difficulty in making a satisfactory explanation. The efferents of the tonsil drain into the deep anterior cervical nodes and not toward the nasal sinuses. If any improvement or cure of sinus infection results from tonsillectomy, it would also need to be explained by an improvement in the general condition, or by raising of the resistance

Editor's Note:—This ms. received in Laryngoscope Office and accepted for publication Nov. 25, 1929.

so that infection in the sinus could be more successfully combatted by one's own anti-bodies.

A great deal of work has been done along this line, but in searching the literature I can find no satisfactory explanation. Dean¹ has clinically shown by his exhaustive work on the sinuses of children that nearly 80 per cent of them get well by removing the tonsils and adenoids. Here he deals with an additional factor: the adenoid, or pharyngeal tonsil. He explains his results by the fact that obstructive adenoids so fill the nasopharynx that a cesspool is made of the nose and as a result the sinus cannot properly drain. As soon as the obstruction is removed, the sinuses drain freely and a cure results.

Foreign substances have been injected into the inferior turbinates and the tonsils removed a few hours later. The substance was recovered from the tonsil on the same side. Other observers have come to the same conclusion. Pognat² injected an emulsion of soot into the turbinates, 24, 36 and 48 hours preceding tonsillectomy. In 100 such cases no soot was found in the tonsils. He concluded that there is no direct connection between the lymphatics of the nose and the faucial tonsils.

Schlemmer³ injected carmen dye in both the nasal and pharyngeal mucous membranes, and concluded: "The injected substance appears in the afferent vessels and in the regional lymph glands of the neck, but never in the tonsils and lymphoid tissues, even though they are entirely surrounded by the dye."

In this same trend Mullen and Ryder⁴ reported on extensive studies in "Lymph Drainage of the Accessory Nasal Sinuses." They experimented with the injection of india ink and bacilli in the sinuses of rabbits and cats. In summing up, they say: "We were struck in the first series by the absence of any discoloration of the tonsils in animals in which nearby tissues were heavily injected, and drew the inference that the tonsil perhaps has no field of absorption beyond its own extensive surface."

Gittens⁵ reported a series of cases of acute tonsillitis following submucous resection and turbinectomy, but does not account for the pathogenesis. In one of his conclusions he says: "In 10 cases tonsils only were removed for the relief of nose symptoms. Four of these 10 have been followed for a period of six to eight months and all have been greatly improved."

Of the 108 cases included in this report, all were above 15 years of age, all of them had a diagnosis of sinusitis made before tonsillectomy was done. Some of them were treated for sinusitis before

the tonsils were removed. All of them were selected from my records over a period of four consecutive years. No case is reported here that has been under observation less than three months, a follow-up has been kept on all of them from two months to four years, either by re-examination or by written correspondence. Nearly all of this series has appeared for re-examination. All sinuses were chronically infected.

A more critical review will show that of the 108 cases there were 43 on whom a diagnosis of ethmoiditis was made, or 39.6 per cent; 33 on whom a diagnosis of maxillary sinusitis was made, or 30 per cent; 31 on whom a diagnosis of ethmosphenoiditis was made, or 28 per cent. One case had a chronic frontal sinusitis.

Those patients who returned and were free of sinus symptoms, and on whom at re-examination there were no findings, I have listed as cured. There were five cases in all, or 4.7 per cent. The number is small and the question arises: Would they have recovered if a tonsillectomy had not been done? Two of the five had been treated in the office over a long period of time, with periodic improvement only. They responded favorably when the tonsils were removed.

Those cases that returned and showed improvement, but still having some symptoms and findings of sinusitis, I have marked improved. There were 51 in all, or 41.2 per cent.

On the entrance examination I have noted the local sinus symptoms, such as: nasal obstruction, anterior and posterior nasal discharge, localized headaches and frequent slight sore throat. Then I have followed by complaints more general, such as general malaise, early or constant fatigue, lumbago, muscle and joint pains, nervousness, loss of appetite, and insomnia. The latter symptoms could well come from any focal infection.

Those patients who returned and reported no improvement in their symptoms and their findings, on re-examination, showed them to be as before tonsillectomy, I have classified as not benefited. There were 52 cases in all, or 48.8 per cent.

Of the five cured cases there were three diagnosed as ethmoiditis, and two as ethmosphenoiditis. In the improved group there were 51 cases: ethmoiditis, 25; maxillary sinusitis, 17; and ethmosphenoiditis, nine. In the group marked "not benefited" there were 52 cases; 18 were diagnosed as ethmosphenoiditis, 18 as ethmoiditis, 15 as maxillary sinusitis, and one as frontal sinusitis. Referring to the table below we have:

Chronic sinusitis following tonsillectomy, 108 cases.

Cured,	5 cases, or 4.7 per cent.	
		Ethmoiditis, 3
		Ethmosphenoiditis, 2
Improved,	51 cases, or 47.2 per cent.	
		Ethmoiditis, 25
		Maxillary sinusitis, 17
		Ethmosphenoiditis, 9
Not benefited,	52 cases, or 48.14 per cent.	
		Ethmoiditis, 18
		Maxillary sinusitis, 15
		Ethmosphenoiditis, 18
		Frontal sinusitis, 1

Conclusion: That tonsillectomy in adults does cure a few infected sinuses and improves many.

Case Report: J. R. H., age 37 years, married. His occupation was that of a filing clerk. The entrance examination was made on Jan. 15, 1926. At this time he complained of dryness in the anterior nares, frequent irritating sore throat, postnasal discharge and headache. The pain in the head radiated over the right eye and at times the entire brow pained severely. Asthenopia was an annoying symptom. At times he had a dull distress in the maxillary region, more on the right than on the left side. He felt weak and fatigued easily. He complained of palpitation on the slightest exertion. He rested poorly at night and arose in the morning unrefreshed. His appetite was poor and he felt generally "run down."

Five years before he had had a turbinectomy done, and two years before he had had all his teeth extracted but with no improvement.

Examination showed a dry, purulent discharge on the anterior surfaces of the middle turbinates, which were swollen and hyperplastic. The septum was markedly deviated to the right high up, so that the right middle turbinate crowded into the middle meatus. The pharynx, the nasopharynx, the uvula, the faucial pillars and the tonsils were red and injected. An X-ray film showed the floors of both antrum slightly blurred and the ethmoids somewhat hazy.

On July 20, 1926, I did a submucous resection and infracted the right middle turbinate. I also washed the antrums through a needle puncture in the inferior meatus and cultured the washings. A streptococcus of the nonhemolytic type was found. Convalescence following the operative procedure was uneventful, so far as complications were concerned, but his symptoms were but little improved

other than he did not have as much headache as before. All other symptoms persisted. On Oct. 8, 1926, I removed the tonsils. From that time on he improved rapidly. He was last seen Jan. 27, 1927. The nose and throat seemed well. I have classified this case as improved.

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CASE REPORT; A LARGE TONSILLOLITH.

DR. H. S. GOODMAN, Cary, Miss.

Inasmuch as large tonsilloliths are comparatively rare, the following case report might be interesting.

S. W., colored, male, single, age 20 years, presented himself, Nov. 15, 1928, complaining of a sore throat. There was no history of previous attacks and his family and past history were essentially negative.

Four days ago his throat began hurting slightly when he swallowed and this symptom had steadily grown worse. He complained of pain on the left side only.

On examination his right tonsil appeared normal. The left tonsil was slightly swollen and the pillars were red and appeared inflamed. The surface of the tonsil appeared to be ulcerated. It appeared to be a simple case of ulcerated tonsillitis, but on applying silver nitrate to the ulcerated area, the mass felt rather peculiar. On wiping it off I discovered it was a large tonsillolith, which was removed with a pair of forceps without undue difficulty. After removal, the throat gave the appearance of having had the tonsil enucleated. The patient has since complained of no further trouble.

After being thoroughly dried out, the tonsillolith measured approximately 21x15x14 m.m. and weighed 3.3 gm (50 gr.).

Editor's Note—This ms. received in Laryngoscope Office and accepted for publication, Dec. 16, 1929.

PEMPHIGUS WITH THROAT LESIONS: SECONDARY INFECTION WITH VINCENT'S ORGANISMS.

DR. LEO SCHWARTZ, JR., New York.

An authority on skin diseases defines pemphigus as "an acute or chronic disease characterized by the occurrence of successive crops of bullae which develop suddenly, often on apparently normal skin, and which may be accompanied by constitutional disturbances of varying degree¹." Meneau², in 1905, collected 41 cases from a group of 135 of chronic pemphigus in which the lesions were confined to the mucous membranes. It immediately becomes apparent that a description like the one above is inadequate. Pemphigus should not be considered strictly a skin disease, but one involving skin, mucous membranes of the respiratory and alimentary tracts, conjunctiva and viscera.

The mucous membrane manifestations are often the first to present themselves and very often the skin lesions do not appear until very late, if at all. The idea that pemphigus is pre-eminently a skin disease is so firmly fixed in the mind of the average practitioner that the diagnosis is seldom made until the lesions appear on the skin. As will be shown later, this may be very late or may not occur at all. Gilbert, in 1813, described a case of acute pemphigus of the mucous membranes and is generally credited with being the first to call attention to this condition. Miller³, in 1897, described a case of chronic pemphigus of the mouth and epiglottis and was soon followed by Bryan⁴, who presented a similar case. Miller, apparently, was the first to recognize the condition in this country. Since then cases have been reported by Farlow⁵, Cocks⁶, Frederick⁷, Coffin⁸, Sonnenschein⁹, Scal¹⁰, Rubenstein¹¹ and many others in this country and abroad. In practically all these cases the lesions were confined to the mucous membranes or were first present there and later showed skin manifestations. Rowlands¹² reports a case of a woman who had the condition for three years, in which no skin lesions had appeared. In the case reported by Lewis the disease limited itself to the oral cavity for 20 months before the skin became involved. The case reported by Coffin confined itself to the oral cavity for four years. Fuchs describes a case of 11 years' duration without skin involvement. Lannois and Curtil¹³ report a case of five years' duration without skin lesions. Frederick⁷ reports a fatal case of

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication Jan. 28, 1930.

pemphigus beginning in the pharyngeal mucosa. Cocks⁶ reports a case limited to the mucous membranes and cites four other cases, etc. Trautman¹⁴ gives a rather rational classification based upon the surface involved and the site of the original lesions: 1. Affection exclusively of the mucous membranes. He cites cases, among them one of 27 years' duration. 2. Coexisting skin and mouth, etc., eruptions. 3. A large number of cases of primary eruption on the mucous membranes and secondary eruption on the skin. He cites cases in which the skin eruption appeared many years later.

There is much confusion in the literature of the terms "primary" and "secondary," "benign" and "malignant," "chronic" and "acute," etc. Briefly stated, pemphigus is a disease involving skin, mucous membranes and other tissues; it may make its appearance first on either, may be very fulminating or mild and assumes every degree of severity; it may rapidly prove fatal or may last for years with little constitutional damage; lesions involving mucous membranes are more severe and are more often rapidly fatal. It might be safely stated that mucous membrane involvement indicates a greater virulence.

Etiology: The disease apparently exhibits few known etiological factors. It seems to occur almost anywhere, with no seasonal prevalence. It occurs more frequently in debilitated persons and the aged. Males are supposed to be more frequently affected than females, although in the cases reviewed the numbers were practically equally divided. The average age was 52 and the ages varied between 22 and 72. Hyde¹⁵ has incorrectly stated that the disease is seen "mainly during infancy and childhood." Various theories have been advanced as to the fundamental factors underlying the disease. Among these are atrophic changes in the nerves, "trophoneurosis," and functional disorder of the nervous system. Pathologic findings at autopsy showed "sclerosis of the cord" and spinal cord lesions. Various attempts have been made to isolate a distinct offending organism from the lesions but so far none has been found. Practically all the bacteria usually found in the flora of the oral cavity have been cultivated. *Bacillus pyocyaneus* has been found in many skin lesions but is regarded as invading the lesions secondarily, and not specifically. All attempts at producing the disease artificially have been unsuccessful. The blebs themselves are said to be auto-inoculable.

Morbid Anatomy: The mucosa in which we are most interested will first be described. If seen early after the initial appearance, characteristic blebs or bullae will be seen. These are filled with serous transudate or may be admixed with blood. This is the excep-

tion rather than the rule, for the bullae seldom remain intact long but soon rupture, releasing their contents. The bullae on the mucosa are in all respects similar to those appearing elsewhere. Due to the amount of trauma associated with eating and mastication and to the fact that they are very thin-walled, they burst easily. Small bullae hidden in the recesses of the oral cavity or in places where little trauma occurs are most likely to be seen. Consequently they are more likely to be observed in the larynx than within the oral cavity, the epiglottis and arytenoid areas often showing intact vesicles. The tracheal lining likewise is a location in which intact bullae may be present. However, these typical lesions are rather infrequently found. Due to the fact that there is much trauma caused by the mastication of food, etc., the life of the vesicle is short and the picture of the entire process changed and this is the stage of the disease most frequently seen and described. The mucous membrane over the area appears surrounded by a reddened areola and may show numerous elevated granulations. The mucous membrane itself has a characteristic "dead" appearance. It has been variously described as a "pseudomembrane," "white membranous deposit," or as having a "slough-like" or "chamois leather" appearance. Any or all of these terms are descriptive of the condition. When the membrane is removed, the typical erosion that is so often described is seen. Some have described the appearance as that of an ulceration, but erosion seems to be the better term. The lesions are shallow and appear to have progressed peripherally, rather than deeply. They are extremely tender and bleed easily and freely. Frequently the condition may progress to the stage in which the membrane separates from its marginal attachment and the raw excoriated surface may be the first appearance to be noted.

The locations that may be involved are: conjunctiva, lips, tongue, mucous membrane lining the cheeks, under the tongue, posterior pharyngeal wall, tonsils—though not usually, pillars of the fauces, nasal mucous membrane, gums, nasopharynx, larynx, trachea, bronchi, hard and soft palates and uvula.

While we are primarily interested in the manifestations in the above places, careful observations for skin eruptions should be made.

Autopsy findings in some of the cases have shown the corresponding condition throughout the alimentary tract, in which ulceration of the muscularis had taken place. Disseminated vesicles on the serous surfaces of the liver, spleen and pleura have been observed. An autopsy on a case reported by Scal showed an edema of the pia mater, a hypostatic congestion of the lungs, membranous enteritis and a hyperplasia of the spleen.

Special Features and Symptoms: Pain on swallowing may be a very early symptom but may not be so severe. However, this is a rather constant symptom and this must be kept in mind. Dryness and a prickling or burning sensation are frequent premonitory complaints. Marked expectoration is present. The sputum may be clear or tinged with blood. Symptoms referable to the larynx are hoarseness, aphonia, dyspnea, feeling of a foreign body within the larynx, and coughing. Chills and headache may precede the appearance of the disease. When the mucosa of the alimentary canal becomes a seat of the disease, intestinal cramps and digestive disturbances are usual complaints.

Fever as a rule is not present, though it may be, particularly when the ailment is severe or when there is marked secondary infection.

Adenitis is not characteristic and usually is not present though in the presence of secondary infection it may be.

Cicatrization does not take place except on the conjunctiva and frequently results in blindness.

There are no pathognomonic laboratory findings.

Prognosis: The prognosis generally is unfavorable and should be guarded. Some patients live from one to three years after the onset. Many, however, succumb within the course of a few weeks or months. Cases have been reported in which the patients have lived for many years, having frequent remissions; and others have apparently been cured.

Differential Diagnosis: The writer feels that this condition is more frequently confused with Vincent's angina than is generally believed to be the case. This is no doubt due to the fact that the organisms of Vincent's are so frequently obtained from the lesions. However, they are secondary invaders. Frequently at mortality conferences in which patients have succumbed to pemphigus, Vincent's angina is given as a contributing cause of death, due to the fact that smears of the throat lesions show Vincent's organisms. Rubenstein reports a case in which Vincents' organisms were repeatedly present in smears. Such cases often go unrecognized as pemphigus entirely or are treated for long periods of time for Vincent's angina without response to treatment. Only upon the appearances of skin lesions is the diagnosis often made.

Vincent's angina affects the tonsils more frequently than pemphigus, which rarely affects the tonsils. The ulceration in the former is ragged and deeper than that of pemphigus, which is shallow and not ragged. The red areola of pemphigus is not a characteristic of the other condition. The dirty-gray covering of the lesion of Vincent's may resemble that of pemphigus, particularly if there is

secondary invasion with the fusiform bacillus and spirillum. It must be borne in mind that in the latter event it may be difficult to differentiate the two, but the possibility of pemphigus should be considered, particularly in elderly, cachectic individuals, in which there is no response to treatment. Vincent's does not form bullae and should there be such, the inference of pemphigus being present is strengthened.

Among other conditions from which pemphigus should be differentiated are: Agranulocytic angina, diphtheria, herpes, syphilis, edidermolysis bullosa, leukoplakia, tuberculosis, mercurial stomatitis, acid and alkali burns and those caused by excessive heat.

Treatment: Treatment should be of a palliative and supportive nature. Everything should be directed toward improving the general health of the patient. Arsenic, in the form of Fowler's solution, or any other form, is the drug of choice in accomplishing this. Iron also is employed, but not with as favorable results.

Local application of orthoform or anesthesin often gives great relief. Methylene blue (solution of 20 grains to the ounce) is beneficial and aids healing. Silver nitrate of varying strength has been tried, but with unsatisfactory results.

Mild cleansing and disinfecting washes are indicated.

In the presence of Vincent's organisms, treatment directed at this condition should be used, as the elimination of this infection has a favorable influence.

Atoxyl was used by Martini¹⁶ with an apparent cure. Doses varying from 0.2 gm. to 0.4 were given hypodermatically until signs of intoxication appeared. Twenty-one doses were given in 33 days. After signs of intoxication appeared, the medication was suspended for one week and then four daily doses were given of 0.4 gm.

Tracheotomy may be necessary when severe laryngeal involvement occurs.

I have been allowed to report a case of pemphigus of the throat simulating Vincent's angina, through the courtesy of Dr. Jacob Bresler, who is chief of the laryngological clinic at Gouverneur Hospital, with whom I saw the patient.

Case 1: I. H., age 49 years, a Russian Hebrew and a butcher by trade, was first seen in April, 1929. The symptoms began six months before examination. He had previously been treated by two other physicians, both of whom had treated him for Vincent's angina by local applications and intravenous injections of neoarsphenamin. He had also been given a mouth wash of the same medication to use at home. Repeated smears taken from the lesions in the mouth had been positive for Vincent's organisms. The onset of the disease was

with what the patient described as a "cold in the throat," which was soon followed by bleeding from the mouth and severe pain on swallowing. He had gradually grown worse in spite of the treatment given him. When first seen he was very cachectic. There were numerous and widespread ulcerations scattered over the tongue, pharynx, pillars of the tonsils, palate and gums. Some were denuded and presented a raw bleeding surface with fragments of necrotic mucous membrane attached to the periphery and surrounded by a reddened margin. Others were covered with white membranes and bled freely when the membranes were removed. The process had undermined the teeth, most of which were very loose, and two had become so loose that they came out during the process of the disease. There were no signs referable to the larynx and the patient would not permit examination, due to the pain. Further examination showed numerous bullae. Some of these had been ruptured and had become infected with pyogenic organisms and were covered over with crusts. The diagnosis of pemphigus was confirmed by the dermatologist in charge of the skin clinic. The patient was not seen again until July and had lost much weight and was generally much worse than when previously observed. He could now swallow only small quantities of fluids.

He died in October, or about a year and a month after the onset. The mucous membrane manifestations had appeared many months before those of the skin. They were so severe that when the typical bullae appeared they seemed apparently trifling and he did not bring them to the attention of the doctor. Of particular interest in this case is the fact that the occupation of the patient was that of a butcher.

The second case is that of a patient in the practice of Dr. A. J. Weinstein, and I am indebted to him for allowing me to present it and for the information he has furnished.

Case 2: T. H., male, about 40 years of age. Furrier by trade. Had been treated at three of the large institutions of the city for an ulcerative condition of the mouth of unknown origin. Onset two months before, with numerous ulcerations in mouth. On examination numerous lesions were scattered over the soft and hard palates, pharynx, tongue, gums, pillars of the tonsils and buccal surfaces. The tonsils were not involved; the lesions varied in size from that of a pea to that of a dime. They were covered with white membranous sloughs and the palate appeared gangrenous. There was much edema of the uvula. There were no blebs present at this time within the mouth or on the skin. No laryngeal examination was attempted, although the patient gave a history of hoarseness. Smears of the

ulcerations were positive for Vincent's organisms. Ulcerations were also present on the nasal septum and conjunctiva. During the first month of the disease he had lost 30 pounds and presented a cachectic appearance. He was treated for Vincent's angina and improved greatly within three days. He felt better generally and the ulcerations assumed a "healing" appearance. Treatment was continued with local applications of neoarsphenamin, intramuscular injections of sulpharsephenamin and a mouth wash of sodium perborate. Two weeks later blebs developed on both elbows and these were soon followed by others scattered over the body. A diagnosis of pemphigus was made and was confirmed by a competent dermatologist. The patient has not been seen in a month but he is still living and his condition unchanged according to his wife. Complete blood examination was made but failed to show anything abnormal.

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215 W. 75th Street.

THE TONGUE SUSPENDER.

DR. I. RUEBERT SMITH, Toronto.

In otolaryngology the careful administration of the anesthetic is of extreme importance; the success of a throat operation depends on its proper administration and the maintenance of a clear passage from mouth to trachea (see Fig. 1).

A very frequent difficulty in the administration of an anesthetic, particularly in short-necked individuals, is the dropping back of the tongue against the pharyngeal wall, constricting the air passage to the lung (see Fig. 2). Breathing is interrupted and patient becomes cyanosed.



Fig. 1.



Fig. 2.

To quickly relieve this condition and also to prevent it occurring I have devised a tongue suspender (Fig. 3), which has proven a great aid in the administration of anesthetics, particularly in throat operations.

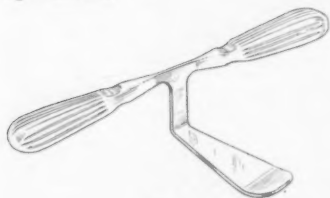


Fig. 3.



Fig. 4.

The spatula end of the tongue suspender is inserted in the mouth (see Fig. 4), then into the pharynx, hooking over the epiglottis. Firmly grasp the handles and twist the wrists (see Fig. 5); in doing so the tip of the spatula is elevated, thus drawing the epiglottis and tongue upward and forward; the patient begins to breathe freely (see Fig. 6), taking the anesthetic smoothly. I advise the tongue

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication Jan. 27, 1930.

suspender be kept in this position during the administration of an anesthetic in the first stage, and if necessary may be kept there as long as it is found necessary (Fig. 5). It avoids the delay caused by interrupted breathing.

The position of the handles extending outward from each angle of the mouth allows the anesthetist to continue administering the anesthetic while the tongue is suspended.

I have used the tongue suspender frequently during the last year for the following purposes: Exposure of the larynx, particularly in



Fig. 5.



Fig. 6.

children; exposure of the pharynx in retropharyngeal abscess; removal of foreign body from pharynx; inserting catheter in trachea and bougie into the esophagus; inserting bronchoscope.

For exposure of the larynx the head should be well extended. Insert the suspender into pharynx, suspending the epiglottis and tongue with spatula. Illuminate the field with reflected light.

116 College Street.

XANTHOMA OF LARYNX.*

DR. HARRY A. SCHATZ, Philadelphia.

The patient, A. P., male, age 30 years, was admitted to the dermatological department suffering from xanthoma tuberosum of five years' duration, affecting the face, eyelids, neck and perineal region.

He was referred to the bronchoscopic department for examination of his larynx, because of dyspnea and some dysphagia. They found an infiltrative condition in the epiglottis and aryepiglottic folds, removed some tissue from the epiglottis (left lateral border, near the base) for biopsy, and the pathologist's report was xanthoma.

Because of recurrent attacks of sore throat, this patient was referred to us. His voice was eunuchoid, a little husky, his tongue was protruded with some difficulty.

By indirect laryngoscopy the epiglottis, of normal size, was found lying almost flat over the glottis, entirely obscuring from view the interior of the larynx, only the posterior borders of the arytenoids being visible as they moved with apparent normal excursion on phonation.

Perhaps the most striking thing noted was the absolute immobility of the larynx, epiglottis and aryepiglottic folds. Neither the epiglottis nor the larynx as a whole seemed to move during vocalization; only the arytenoids could be seen to move, as above noted.

A review of a considerable amount of the literature on xanthoma failed to elicit a single case wherein the larynx was also involved. One case reported in the *Arch. per le Science Mediche* of 1927 aroused my interest as being related to this one, though not really one of xanthoma. That case was reported as one of "Progressive Hereditary Pachydermatous Dystrophia of Skin and Mucous Membranes" by Prof. R. Rössle, Turin; and concerned a servant woman, age 38 years, whose mother had some indurative lesions on the lower extremities only, while this patient developed lesions a few weeks after birth, the larynx becoming involved early in life with hoarseness, often aphonia; difficulty in protruding the hardened tongue, and some small nodules on the lower lids. At the age of 20 years the thickening of the skin was worse, she could hardly

*Read before the Philadelphia Laryngological Society, Dec. 3, 1929.

Editor's Note:—This ms. received in Laryngoscope Office and accepted for publication Dec. 20, 1929.

open the mouth, the tongue still less mobile, swallowing was more difficult except for fluids, and on exertion there was stridor. The nasal mucosa was normal until much later. The postpharyngeal wall and sinus piriformis showed scattered white spots, the epiglottis was thickened in its upper and lower portions, grayish-red in color. The true and false cords were grayish-pink, with induration on the true cords and adjacent portions of the larynx. Later the epiglottis became thick, distorted, white; even the tracheal mucosa was white and thick.

Eventually, two years before death, a tracheotomy was performed to relieve dyspnea, X-ray to the larynx being helpful as an accessory treatment. As dyspnea became worse inspiratory stridor, cyanosis and death followed.

The pathologist reported neviiform systematic hyperkeratosis of the skin, mucosa of the mouth, esophagus, pharynx, larynx and bronchi. There was marked stenosis of the larynx, also myxomata and polypi of the uterus.

At this stage permit me to mention the analogy existing between skin and mucous membranes, both being epithelial tissues, both participating in the elimination of toxic or unnecessary substances; e. g., iodine, bromine, to mention familiar chemicals. Small wonder then that the mucosae participate in certain skin lesions. It is my own belief that chronic sinusitis does in some cases have associated with it eczema on the related skin areas. It is surprising that we do not observe more frequent instances of that type; or are they overlooked?

For the privilege of presenting this case the writer expresses his appreciation to Dr. Ralph Butler, Dr. Chevalier Jackson, Dr. J. F. Schamberg; and also, for their helpful co-operation, to Dr. S. S. Greenbaum and Dr. Case, all of the Graduate Hospital, University of Pennsylvania.

1930 Chestnut Street.

STENOSIS OF THE LARYNX AND TRACHEA.*

DR. HOMER A. BEAL, Kansas City, Mo.

I wish to discuss the problem of laryngeal and tracheal stenosis and will present for your consideration three cases which came under my observation during the last year.

Etiologically, these cases differ widely, and the location of the stenosis is at different levels in the laryngotracheal structure.

Hazel G., age 42 years, was admitted to the General Hospital, Dec. 8, 1928, with two deep transverse wounds of the neck which had severed the skin, subcutaneous tissue and had cut through the trachea just below the cricoid cartilage; no large vessels were severed. On the following day repair of the wound was made by the surgical service, at which time the fascia and subcutaneous tissue and skin were closed with sutures. Eighteen days later a secondary repair was made, the wound having become infected, with complete retraction of the wound and exposure of the tracheal fistula. Three weeks later, Jan. 24, 1929, patient was readmitted to hospital with marked respiratory difficulty, and at 9:30 in the evening an emergency low tracheotomy was done under local anesthesia. The larynx continued to be very edematous, and one month later a direct laryngeal examination was made with findings of marked swelling of all the laryngeal structures and inability to pass the cords with scope. Eight months later, following the advice of Dr. Haslinger, a lower tracheotomy was done, feeling that this might relieve some of the cricoid reaction of swelling, but this did not serve to help as in a few days the tube was in its old position. Two weeks following, under local anesthesia, laryngofissure was done and a rubber tube, about 2 in. long by $\frac{1}{4}$ -in. in diameter, was placed in the trachea and larynx and fixed with a small silver wire passed through the laryngeal cartilages, and the overlying structures of neck as nearly as possible approximated by sutures, the tracheotomy tube was left in place. The tube was left in place six weeks and then removed through the tracheotomy opening; breathing was good but, not feeling secure, the tracheal cannula was left in place. The patient was seen several weeks in succession, and breathing was dif-

*Read before the Kansas City Society of Otolaryngology and Otolaryngology.
Editor's Note:—This ms. received in Laryngoscope Office and accepted for publication Jan. 25, 1930.

ficult through normal passage with cannula closed. This patient will have to be retubed.

Harold S., a boy, age 16 years, was admitted to Kansas City General Hospital, Feb. 2, 1929, with a gunshot wound of neck, a .22 lead bullet having passed through his larynx laterally. There was marked subcutaneous emphysema about right side of neck and face. Voice functioned fair. Painful and difficult swallowing. Coughing blood-tinged sputum. Forty-eight hours later rather sudden respiratory difficulty and cyanosis oxygen was administered and emergency low tracheotomy done (suction, much purulent fluid from trachea).

Indirect examination: Larynx showed edema of ventricular bands and cords. Very small glottic chink and lack of abduction of cords. Two months later a direct examination of larynx was made and the left arytenoid seemed fixed and a growth was noted at the region of the left vocal process, closing the posterior commissure region. No stenosis below cords. Two months later a web in the posterior half of cords was severed with a knife. This was followed at intervals of a few days by passing scope and dilator, but adhesions rapidly reformed.

Two months later a laryngofissure was done and a web between cords severed and a rubber tube anchored in place with silver wire through laryngeal cartilages. Twenty-five days later the tube was removed, with good breathing function and good voice function.

Dolly S., age 3 years, was admitted to hospital with a history of respiratory difficult for past 11 days, following a choking spell while eating parched corn. X-ray failed to reveal any foreign body. Child had both inspiratory and expiratory stridor; no cyanosis. Upper right lobe lung, increased breath sounds. Under ether anesthesia direct bronchoscopy and the foreign body, a whole grain of corn, found about 2 inches below the glottis; the grain of corn acted as a ball valve with each respiration. The foreign body was removed and child's condition was reported good. About one hour later the child became cyanotic and oxygen was administered; her condition gradually became worse, and two hours following the bronchoscopy a tracheotomy was done with almost immediate relief. However about one hour later cyanotic spells returned and child died. Postmortem examination was denied but I passed the bronchoscope and found no edema of vocal cords or larynx, no bleeding from the larynx or trachea; at the site of the foreign body there

was marked edema and the lumen of the trachea was practically closed off.

This would appear to be an acute stenosis from a perichondritis at the site of the foreign body.

With reference to the two cases of laryngeal obstruction, this open operation with insertion of dilating tube of Prof. Schmiegelow can be easily and safely performed.

The third case, with tracheal obstruction following the removal of foreign body, might have had a favorable outcome had the location of the stenosis been known and a rubber catheter or "Mosher's life-saver" tube passed through the tracheotomy wound.

1002 Argyle Building.

International Digest of Current Otolaryngology.

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F. L. Reese, of Phoenix, Ariz., in *Southwestern Medicine*, November, 1929, states that ice pack or collar is definitely contraindicated following tonsillectomy. He was led to this conclusion by the fact that the hospital operated cases received ice packs or collars immediately following operation, while office operated cases did not. This held good for both local and general anesthesia. In searching for the cause of this apparent discrepancy, Reese decided to discontinue the use of ice packs, and in the last 250 operations he has had only one minor hemorrhage. He claims that the ice pack is a positive menace and makes no attempt to analyze the physiological principles underlying its use.

In any nasal operation, secondary hemorrhage may be a very serious and troublesome complication. When a hemorrhage occurs there is often great confusion in getting together the necessary materials for its control, during which time the patient is rapidly losing blood. In some of the intranasal operations, it is desirable not to use packing at the time of operation, such as in the radical intranasal sphenoethmoidal operation. These patients do much better if packing can be omitted. When the ethmoids are removed and the sphenoid widely opened a catheter passed back through the nose for the placing of the postnasal plug will frequently engage in the sphenoidal cavity. This delay is both annoying to the surgeon and serious to the patient. To overcome this difficulty I invariably place permanent strings through the nose, bringing them out through the mouth, one on each side, forming a loop. These are tied and secured to the face with adhesive plaster, and are left in position for a day or two. These strings are passed while the patient is on the operating table at the conclusion of the operation. Then two conical-shaped choanal

plugs are made out of absorbent cotton, and are given to the nurse to take to the room for an emergency. If a hemorrhage occurs the houseman is instructed to tie the pointed end of the choanal wedge-shaped plug to the string in the nose. This is drawn through and immediately pulled into position. If this is not sufficient to stop the hemorrhage the anterior part of the nose is packed. This precaution has saved me a great deal of worry and conserved on several occasions considerable loss of blood on the part of the patient.

JOHN EDMUND MACKENTY.

Dan McKenzie, in the British Medical Journal, Nov. 23, 1929, states that he is firmly convinced that diathermy coagulation will come to be the method of choice for removal of tonsils in adults; he contends, however, that it is unsuitable for children.

The increasing recognition of sinusitis in children as a cause of pulmonary infection is pointed out by Reisman in the Archives of Pediatrics for November, 1929, Vol. 46, No. 11. He summarizes the routes of infection as:

1. By way of the lymphatic vascular route, *i. e.*, submaxillary and retropharyngeal nodes into the deep cervical and internal jugular nodes, then into the lymph ducts, great veins, right side of heart, and then into the lungs by way of the pulmonary artery, and from the lungs by lymph channels into the hilar glands.

2. By extension through inhalation.

ROSENBERGER.

Rossier and Guggisberg, in the Schweiz. Med. Wochenshft., No. 43, 1929, present a report on the study of latent diseases of the maxillary antrum with special reference to general medical conditions. They claim that latent maxillary sinusitis is a much commoner disease than commonly thought, and it is very frequently the etiological seat of some general disturbance. They present their report in statistical form, on 839 patients who applied at the internal medical clinic. These are symptomatically divided into the various systems of the body, and it was found that 5.2 per cent of the total suffered from latent maxillary sinusitis. Among other findings is the fact that sciatica was frequently due to this cause. While 18 per cent of respiratory tract affections were found associated with sinusitis, only 0.8 per cent were found in pulmonary tuberculosis. They deduce that there must be a very definite antagonism between the two. They also deduce that the acute major pulmonary affections,

such as pneumonia and pleurisy, are also antagonistic, where as chronic bronchitis was associated with latent maxillary sinusitis in about 22 per cent of cases. In asthma and bronchiectasis this percentage is rather high. In conclusion they stress the importance of maxillary sinusitis in nontuberculous affections as opposed to its rareness in tuberculous affections.

This study by Rossier and Guggisberg should furnish much ground-work for further intensive systematic research of such an all-important subject.

Schugt, writing in the American Journal of Surgery, December, 1929, Vol. 7, No. 5, submits his further experience in the injection of the superior laryngeal nerve for dysphagia occurring incident to laryngeal tuberculosis. He describes the position of the nerve in the pyriform sinus and states his results in the injection of the nerve in this locality in a series of 10 cases. He believes that this method will not displace the method of Hoffman but that it is a distinct addition to the existing methods for the treatment of dysphagia in tuberculosis of the larynx.

ROSENBERGER.

G. A. Smith, of Montgomery, W. Va., in the Journal A. M. A., Dec. 14, 1929, reports on a case of gas bacillus infection following tonsillectomy. Operation was done under general anesthesia with the Beck-Schenk instrument. Tonsil fossae were clean and there was no hemorrhage. The next two days were uneventful, but on the fourth day the patient was found to have intense headache, pain in left eye, pain in the extremities, temperature of 103°, pulse 120 and chills. Left side of neck and face was swollen, tender to touch and crepitation present. Left tonsillar fossae closed by edema of the pillars and soft palate. Emphysema continued to increase in spite of surgical intervention and injection of bacillus perfringes antitoxin. Patient died 12 days after tonsil operation.

The author believes that had it not been for the site of infection in this particular case preventing radical incision and drainage, the patient might have recovered.

MYERS.

Dr. J. F. Barnhill, of Indianapolis, is scheduled to be the guest of the Kansas City Society of Ophthalmology and Oto-Laryngology, March 20, 1930. Dr. Barnhill will conduct an operative clinic in the morning, consisting of radical mastoids, maxillary and frontal sinuses; in the afternoon he will conduct a diagnostic clinic on the ear, nose and throat.

BOOK REVIEW.

Handbuch Der Hals u. Nasen-Ohrenheilkunde. By Professor A. Denker and O. Kahler, Volume VIII. Berlin: Julius Springer. Price Rmks. 60.

This volume contains, under individual and exhaustive chapters, the following important phases of pathology and therapy: Otitic Diseases of the Meninges, by Dr. Max Goerke; Otogenic Sinus Thrombosis and Otogenic General Infection, by Professor Ludwig Haymann; Brain Abscess, by Professor Bernhard Heine and Dr. Josef Beck; Occupational Diseases of the Ear and Acoustic Trauma, by Dr. Alfred Peyser; Mechanical and Psychic Trauma; Hysteria, by Dr. O. Muck.

All of these chapters are thoroughly presented, and the literature seems complete. We cannot refrain from the comment, however, that all partiality is shown to German literature and German investigators.

Under the general subdivision "Deaf-Mutism," Professor Denker contributes a chapter on the Pathological Anatomy of Deaf-Mutism which, on final analysis, proves to be the same subject-matter as contributed by this distinguished author in other textbooks and monographs.

Functional Examinations and Their Results, by Professor Wilhelm Brock, of Erlangen, is, as previously commented, presented to show every partiality to German authorities. Bezold and Urbantschitsch are given all the credit to which they are justly entitled for their work in the re-education of the Deaf, and even some of the lesser lights of the German school are favorably mentioned in carrying on these interesting acoustic exercises and stimulation with tuning forks, accordion, etc.

Either the work that has been done in America in this interesting field of re-education is unknown to the author or it has been intentionally omitted from this chapter, both in the descriptive text and in the literature.

As reviewer we are holding no brief for the scientific superiority of our American contributors to this re-educational work with the Deaf, but we are seriously concerned in presenting a most emphatic plea for impartiality in quoting literature.

If this had been the first offense of this character by distinguished German authorities in Oto-Laryngology, we might have condoned it from a scientific or editorial point of view, but as it has occurred frequently enough within the past two decades to call forth both the reviewer's and the editor's protests in THE LARYNGOSCOPE, we cannot but feel that there is an intentional neglect or oversight of America's contributions.

The name of Alexander Graham Bell alone is gloriously significant as an individual uplifting force and influence for the Deaf, and his accomplishments for the education of the Deaf have been of so distinguished a character that a German colleague who presumes to discuss a chapter on the Education of the Deaf with authority must feel a serious embarrassment to have forgotten this name when enumerating the distinguished German confreres.

As a concluding comment, the reviewer would prefer to call this a *German Treatise of Diseases of the Throat, Nose and Ear*, rather than an *international* one.

M. A. G.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTOLGY.

October 11, 1929.

The Nonsurgical Dry Treatment of Suppurative Otitis with Iodine Powder. Dr. Moses D. Lederman.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. D. J. McDONALD: Some years ago when Dr. Lederman called my attention to this powder I took the matter up in a scientific way, and I can confirm all the statements he has made. One of the patients mentioned by Dr. Lederman in his case reports was one of my patients. I had occasion to use this on one patient by the Politzer method, cleaning out the cavity with warm air. I congratulate Dr. Lederman on the work he has done, for I have seen a number of these cases in past years, and I have seen the results of his conscientious attention to get good results. We must consider this as a great advance. I see many cases at the present time in an institution devoted to children, and the results are remarkable in some instances. The powder is sometimes used with a glass tube, but not with children, for the child is apt to break the tube. The ordinary small cannula, No. 1, of sterling silver, can be used very carefully. The nasopharyngoscope can also be used to great advantage. We have many cases with not only granulations in the ear itself but in the tympanic cavity; here is where we get much trouble—in the tip of the promontory, and we are liable to have hemorrhage, etc., and get dizzy and fall over in the chair.

Again, I wish to say that I thoroughly agree that every man here should study this technique that Dr. Lederman has described and, if carried out as he does it himself, I believe that everyone will be more than satisfied with the results.

DR. I. GRUHLAW: I saw the powder when Dr. Lederman first introduced it, having followed his work for years. We all know of the dry treatment with boric acid, but no one claimed such perfect results as Dr. Lederman with his iodine dusting powder. The accumulated evidence of all the cases exhibited prove the efficacy of the treatment detailed. A chemist was in my office some time ago and said: "The powder looks like thymol iodide." I tried thymol iodide, but it was by no means so effective, as it caked and stopped drainage. I therefore gave it up. Dr. Lederman's treatment does away with most radical operations. I think that the case where the mastoid cavity was filled with granulations and cholesteatomatous material shows a really marvelous result. I see a great many cases of radical mastoids where the patients are still badly off; their ears are running, and Dr. Lederman's treatment has to be used—so why operate? The fact is that in Europe they are operating radically less and less. I think Dr. Lederman is to be congratulated on his painstaking work and brilliant results.

DR. M. J. MANDELBAUM: In 1925, I was engaged in some experimental work in fluoroscopic bronchoscopy; lipiodol was being used at that time and I wondered if iodized oil would not be of some diagnostic value in cases of chronic otitis with perforated drum; so in several selected cases I injected the ears with lipiodol; after several years of use, I was astonished at the unexpected improvement of the chronic otorrhea in several cases in which the patients had been advised to have a radical mastoid operation.

While I undertook this "Arbeit" to determine the diagnostic value of instilling iodized oil into the mastoid cells, I was unexpectedly rewarded by obtaining what proved to be several cures from the iodine content of the oil coming into direct contact with the diseased areas of the middle ear. The article describing these results was published in THE LARYNGOSCOPE, March, 1929. In searching the literature at that time I investigated the therapeutic value of

iodine in various combinations in both rhinolaryngology and otology; and found that it had been used by a number of men in different forms; but the first reference that I found of the use of iodine in chronic otorrhea was that of Dr. Lederman, in 1917. I think he is really too modest about it; he does not claim priority, but I am sure that to Dr. Lederman belongs the credit of having brought the attention of the profession to the value of iodine in otorrhea. In looking over the literature and coming across his article, I was reminded of the fact that I had been present at a meeting of this Section, in 1917, when he read his original paper. I think Dr. Jarecky has had some good results with the same powder. By a strange coincidence one of the cases that I treated had been operated for a mastoid condition by Dr. Lederman 25 years before and had had a second operation by Dr. MacEwan Smith, and a third by another otologist eight years later, but the ear was still discharging when I first saw the patient. The use of the iodized oil resulted in a cure. Then I used other iodine medicaments, including the powder that Dr. Lederman uses, and I must say that while I primarily used the lipiodol in the mastoid cells for diagnostic purposes and had surprisingly good therapeutic results from its use in a number of cases of chronic otorrhea and chronic recurrent mastoiditis, since using the iodine powder, I know now of no superior medication or method that can compare with the iodized powder. I have here two films, which seem "apropos" to the topic of this evening. These films show the results in the case that had been mastoidectomized by Dr. Lederman and subsequently by two other otologists. Its importance lies in the fact that it positively visualizes the iodized oil globules in unremoved diseased mastoid cells. There is no question in my mind but that the same curative changes take place by the iodine powder as by the iodized oil, the first being much more efficacious, however. Film No. 1 shows the case after the first series of iodized oil instillations in October, 1927; and Film No. 2 after the second series in February, 1928; these excellent Roentgenograms were taken by Dr. Solomon Fineman. Film No. 1 shows the marked result in clearing of the cells by the use of the iodine as combined in the lipiodol, and I believe an analogous process takes place by using the iodine powder. I will pass these films around as they are an excellent visual demonstration, illustrating some of the facts mentioned by Dr. Lederman.

DR. H. JARECKY: Dr. Lederman called my attention to this powder eight or nine years ago and since then I have been using it in chronic suppurative cases. To be successful, I soon discovered, one must use a careful technique. The method I employ is as follows:

A suction tube to clear up all discharge and to draw out of perforations any granulations or polypi. These I anesthetize, adrenalize and then apply pure alcohol on a cotton carrier directly to them as this shrinks the growths and so are more easily removed. The parts are dried again and the powder in varying strengths is insufflated and sometimes packed in.

I can only corroborate and thank Dr. Lederman, as I have had the same wonderful results. I have tried ionization and the various methods of dry treatment but have had the best results with the iodine powder.

I have also had excellent results in subacute cases. Occasionally intense pain is felt over the face but this is usually only of short duration.

DR. H. M. SCHEER: I would like to take a moment to say that while Dr. Lederman has recited a number of complimentary remarks by doctors who have taken the trouble to write to him, I can assure him that hundreds of doctors are using this powder with just as excellent results but have never spoken to him about it. I have used it for about nine years, and have used it on every case that had no menacing complication. Of course the patient must co-operate over a long period. I should say that 75 to 80 per cent of chronic otorrheas will dry up under the use of the powder. I have learned tonight that it can be used in various strengths. I get it at Nauheim's; I do not know what strength it is. It certainly should be used until one of two things happens: either the patient quits you or something happens that threatens an arising complication. That is giving the patient as conservative treatment as possible. I have one patient, an intimate friend, whose case I had been watching for the past nine years, and I did not want to do radical surgery. Dr. F.

saw him some years ago with an acute headache lasting nine days. He advised keeping up the conservative treatment unless the headaches increased in severity, then to operate. The conservative treatment was continued until a year ago, when it was evident that something had to be done. As soon as the acute complex subsided, I did a radical operation, resulting in a dry ear. The majority of these chronic otorrheas will dry up under the powder.

DR. A. F. LASZLO: I have had a series of 100 cases of chronic running ears, where I have used iodine powder in the clinic of the Harlem Eye and Ear Hospital, in the year 1928, and am using it as a routine treatment with excellent results. At that time I did not know of the work of Dr. Lederman, and I was looking for a German preparation, "ulsanin," which I had previously used. I could not obtain it but got the information that the Sulzberger powder or nascent iodine powder, 0.69 per cent, had a similar chemical compound. In my routine treatment I used peroxide and a few drops of ether to clean out and dry the ear. The dryness is one of the most important factors.

I have had very unpleasant experiences with the use of stronger percentage of the powder (2 per cent or higher), because it causes very severe pain hours after treatment. I had a case of a 15-year-old boy, who had very bad pain in the ear until about eight hours after the administration of 2 per cent iodine powder, when I had to give him some analgesic.

My results were very excellent with this treatment. About 95 per cent of the cases dry up. I purposely do not use the word "cured," because I have seen quite a number of patients return with a running ear again after a few months.

Among the interesting cases I had, there are two very striking ones; one a 24-year-old girl with epileptic attacks, running ears for many years, and epileptic attacks after two week's treatment, when the ear became completely dry. Another case: a 64-year-old man, after 57 years of running ears, the ear was dry and remained dry after one single treatment. I do not let the patient use any home treatment, and they are treated three times a week at the hospital.

DR. E. M. JOSEPHSON: Referring to Dr. Mandelbaum's mention of lipiodol, he stated that the use of lipiodol in the ear in the presence of a fistula leading into the inner ear is distinctly dangerous. He cited a case in which the use of lipiodol incited an acute labyrinthitis.

With regard to the use of powders composed of boric acid and iodine, he bore out what Dr. Lederman had to say upon the subject. He recalled two of the cases which he treated for Dr. Lederman in his absence.

He mentioned several items which were overlooked by Dr. Lederman. Irrigation of the attic with a hypertonic solution, by the physician and under proper precautions, is occasionally advisable for the removal of debris and detritus.

Ears in which the drum membrane is missing should be observed at regular intervals, even after the original infection has been cleared up; for the epithelial scales and other matter which collect in such ears are very apt to become infected from without by way of the perforated drum.

The original iodine dusting powder patented by Dr. Sulzberger is one of a number of similar preparations. Ulsanin, a German product of the same composition, has been used for several decades. Still another, iodobor, is prepared with anhydrous acid and iodine by a dry process, and is exceptionally free of water of crystallization, and is consequently less likely to cake.

Dr. Josephson stated that the results obtained by the use of any of the powders composed of boric acid and iodine are astonishing.

DR. MANDELBAUM: I would like to ask what Dr. Lederman has noted as the average length of time needed for drying the ears under the iodine powder treatment.

DR. H. B. BLACKWELL, Chairman: I should like to congratulate Dr. Lederman upon the results of his treatment for the relief of chronic otorrhea as shown by the patients whom he has presented here this evening. I feel, however, that a good many factors apart from the iodine content in the powder had to do with the successful results shown. A number of the patients had been treated improperly before consulting Dr. Lederman, such as having had too frequent and copious irrigation, which he properly discontinued; furthermore, his careful removal of polypoid tissue, cholesteatoma, discharge, etc.,

resulted in improved drainage and aeration of the middle ear; also, when necessary, his correction of pathological conditions in the nose and throat. We must also remember that his powder contains a large proportion of boric acid, and we are all familiar with the beneficial effect of this powder alone when used in the dry treatment of chronic otorrhea. In discussing the end-results which it is possible to secure by treating chronic otorrhea, one point has not been mentioned, namely, how does the hearing compare with a similar series of cases who have been successfully operated upon by means of a modified radical? In my own experience better hearing has followed after the modified radical operation when indicated than in similar cases where treatment has been employed.

DR. LEDERMAN, closing: I appreciate the kind remarks my friends have made, especially those by men who have used the powder and have corroborated my personal experience. I did not know that so many were using it.

Of course, we take it for granted that any nasal or pharyngeal condition that may be a factor is properly attended to. In the paper, I mentioned that even after a radical operation these cases have to be kept under observation in order to remove accumulations of epithelial debris—no matter how well the radical or modified radical operation has been performed. This condition also occurred in cases operated upon by myself.

Referring to Dr. Mandelbaum's remarks about the use of lipiodol: I feel as Dr. Beck does, that here we have a dry therapeutic agent that contains iodine in a very volatile form. To emphasize the rapidity with which the iodine is given off, I might digress a moment to say that I have been using this preparation a good deal in nasal suppuration also, and in a few seconds after it is applied the patient feels the action of the iodine in the sinuses. That is one of the great advantages of this powder—that as soon as any moisture meets the powder, the iodine is promptly given off; the ionization of the boric acid molecule makes the boric acid soluble.

I would take exception to the Chairman's remark that boric acid does not cake. I have seen it cake frequently. We all know that many years ago we used boric acid for chronic suppuration, but gave it up on account of the caking and damming back of the suppuration, exposing the patient to absorption and extension of the infection. That is the advantage we claim for this powder; it does not cake, which is a very valuable asset. The liberated fumes find their way readily into the mastoid cells, as shown in Dr. Mandelbaum's pictures. They certainly reach places where the instrument cannot. In one of the cases shown, the girl treated in Naples by an eminent otologist five years before she came to me, the effect was obtained by cleaning the posterior region of the middle ear and filling the attic with the powder; I not alone filled the large opening in the drum with the powder, but used a little added pressure by means of the compressed air apparatus or Politzer bag, compressing the air so as to force it in delicately with six to eight pounds of pressure, and so getting as much as possible of the powder into the attic—for the more powder we get in, the more ionization results. It was for this reason that I mentioned in the paper that if the perforation is very small I do not hesitate to make it larger, so that by suction and otherwise I can cleanse it thoroughly and introduce more powder.

I never use a glass tube with children, but a small metal cannula is introduced right into the perforation until I feel that the ear is perfectly clean. I never hesitate to enlarge the opening when I feel it necessary.

As mentioned, all irrigations must be stopped at once. Dr. Beck reports that old cases are kept up by this maceration. That is one of the cardinal points in my technique. It may be mentioned also (of course this paper recounts my own experience) that I have at times found it difficult to dry the ear thoroughly in some of the attic cases. Then I have resorted to the use of dry heat. This idea was borrowed from the dental profession, having noticed that when they cleaned out a pulp cavity they finished by applying a dry heat by means of a little blower generating heated air; so I took a similar instrument and adapted it for aural treatment. The cannula can be bent at different angles; then, holding the reservoir of the instrument over an alcohol lamp, the heated air, by an eight or 10-pound pressure, can be applied to any area desired, and it helped materially in some of these attic cases.

As to the chemistry of the procedure: I am not sufficiently a chemist to give the details; but Dr. Sulzberger got the idea that if iodine was incorporated with the boric acid so that it was loosely combined, it would volatilize readily. It is not a distinct chemical combination. It is probably produced by an alcoholic solution or an ethereal solution of iodine in any strength desired, passed over or through boracic acid by a special process. The strength of the powder depends upon the iodine content in the solution. To obtain the powder, the solution must be thoroughly evaporated. To hold its content, the powder should be kept in dark-colored bottles with tightly-fitted glass stoppers. If the powder is not properly prepared it is not effective. Some individuals at present are attempting to substitute a powder for the original. That is my reason for calling your attention to the importance of specifying the iodine powder (Sulzberger). The results in some cases depend on the strength of the solution used; I have used one-half of 1 per cent, three-fourths, 4, 5, up to 10 per cent. The pharmacist who is now distributing the original formula is Lascoff and Son, at 83rd street and Lexington avenue. It is the formula of Dr. Nathan Sulzberger, chemist, and he had the powder prepared for me. My supply is becoming limited, and I have requested Dr. Sulzberger to place the powder on the market. The gentlemen whose experience I have mentioned obtained their supplies from me. The value depends on the solubility of the powder, together with the rapidity with which the iodine is given off. It is minute impregnation of boracic acid with iodine, prepared by special technique.

In answering Dr. Blackwell's comment about the young lady whom I mentioned as having been operated upon: It was not the operated side that I treated, the right; but it was to save the hearing in the diseased ear, the left, that I used this method. The other ear was dry after the radical operation, but the hearing was greatly lowered. The conservation of the hearing is one of the advantages that I claim for this method of treatment.

No, I cannot state that all suppurative cases are curable without surgical intervention. As you heard one of the previous speakers say, he was treating a case for a long time, and then it had a flare-up. I only say that I am content to watch the cases for a long period, unless some fulminating conditions appear, and then operate; but for the last 10 or more years I have not been compelled to resort to radical surgery with this powder treatment, and I have seen some very chronic and dubious cases.

Recently, Dr. Beck kindly referred a patient who had suffered from a chronic suppuration for several years. She had been sent to him for an opinion as to the advisability of surgical intervention. This patient received two treatments within three days, and was then told to return to Dr. Beck for further treatment. About a month later she wrote me, stating that her ear had remained dry, and Dr. Beck did not find it necessary to apply the powder.

Some cases require eight or more months of treatment, the time depending on the pathology and on the duration of the disease; some have been cured in six weeks. One case bearing on this question was that of a little child, age 4 years, that I was treating for three weeks for an acutely infected ear. I had incised the drum and cleaned the ear thoroughly, but felt there was still some obstructive condition, so used the powder. (I seldom use it in the acute stage, but after the acute manifestations have subsided and the suppuration persists, the powder is applied.) This child I thought would have to be operated upon, but one day she came in with the perforation occluded with granulation tissue. This obstruction was removed to re-establish drainage, and the 2 per cent powder was used. After three or four days, the ear dried up. In some cases where the strong powder is employed, the patient will experience some pain on account of the prompt liberation of the iodine. This can be avoided by using some local anesthetic before insufflating the powder. It is not simply the application of the powder, but the attention, time, patience and conscientiousness expended that secure the result. It is quite astonishing to see some of these chronic suppurations dry up after a few treatments, as instanced in the case of Dr. L., presented this evening, who came to me with a history of 24 years' duration, and was cured after three treatments.

The Modified Radical Operation. Dr. Morley T. Smith.*(To appear in a subsequent issue of THE LARYNGOSCOPE.)*

DISCUSSION.

DR. H. M. SCHEER: Being associated with Dr. Smith on the same service, I, too, have advised going into a number of these cases that warranted surgery, by selecting the type which did not appear to have the deafness coming on very rapidly, and where one would attempt to do the modified radical with the idea of possibly saving the hearing—in which cases we know that the modified radical does do less damage to the hearing than the radical. In such cases I have made it a practice, if we are doing any surgery, to do the modified radical first. In all the cases that required a modified radical operation, I have found that the granulations have dried up and disappeared; and, following the operation, the tympanic membrane is often entirely restored. The perforation closes up unless there has been such a marked destruction that there is no hope for it. But there is no question of the value of the modified radical in the attempt to dry up the ear.

We have approached tonight the extreme conservative measure and approached an extreme radical measure of surgery. I have done very few radical operations in private practice, for there the patients will co-operate more readily than in clinical practice. In clinic practice you cannot get your patients to come three times a week, as they should; in private practice you may see them five times a week. In clinic practice if you have them for long periods of conservative treatment, they quit the clinic. That is one of the reasons Dr. Smith mentioned, that so far as the economic status of the patient is concerned, surgery is more practicable than conservative treatment. Very likely in many cases if the powder was applied and the patient seen as we do with our private patients we would not have to do as many radical operations as we do; and the fact that we do some sort of procedure after which we can get the patients in as frequently as we wish, that in itself may help dry up the ear.

DR. BLACKWELL: The Chairman would like to say in connection with the postoperative care of modified radical cases, it is most important to prevent granulations from forming in the antrum, which interfere with aeration of and drainage from the middle ear. The antrum region should be encouraged to dermatize as quickly as possible and to remain permanently free and open. This is best secured by cutting one large flap in the concha instead of two small ones and attaching this large flap above to the temporal fascia. The antrum cavity is then packed snugly with plain gauze, which is changed daily until the region is dermatized. It was formerly my custom to irrigate the wounds of these patients; this I have discontinued in favor of daily packing.

The Chairman feels that the Section is fortunate this evening in having two such excellent papers by Dr. Lederman and Dr. Smith, one presenting the treatment and the other a conservative operative viewpoint of the same subject, chronic otorrhea. We must remember that both the treatment and the operation have their distinct spheres of usefulness for this condition. Both papers well illustrate the more conservative attitude which has been adopted by otologists in recent years towards O.M.P.C.

DR. LEDERMAN: Dr. Scheer has mentioned an important factor. These chronic cases that should be treated conservatively will seldom get well in the clinic. It is physically impossible to give them the necessary time and attention. It requires personal care and conscientious stick-to-it-iveness to get good results. My private patients are treated by this method, because I have had the conservation of the auditory function in mind. That is an important consideration. Many people come to you with moderate means, who depend upon their hearing to make a living. If we are to preserve the hearing, I do claim that much can be accomplished by this treatment. Many of these cases, simply because they have a running ear for years, are operated upon for they feel that it is the quicker way. But for the last ten years in my private practice, I have not been compelled to resort to radical surgery. I am convinced that if these cases are given careful attention the great majority of them can be dried up.

SECTION OF LARYNGOLOGY AND RHINOLOGY.

Wednesday, Oct. 23, 1929.

Dr. Mervin C. Myerson, Chairman; Dr. John M. Lore, Secretary.

Chronic Frontal Sinusitis with Acute Exacerbation. Dr. Arthur Palmer.*(To appear in a subsequent issue of THE LARYNGSCOPE.)*

DISCUSSION.

DR. T. J. HARRIS: I had an opportunity of examining this case, and wish to congratulate Dr. Palmer on the very complete report he has made of it, and also upon his very frank statement about its present condition. It is my feeling, in the light of the history of the case, that it should have been operated upon at the onset of the attack. In my experience, X-rays of the frontal sinus have never failed to give help in making a diagnosis, although I do not presume to depend solely on them. There are several possible causes for the reinfection which has taken place: It is quite possible that all the diseased cells were not removed; a common cause for reinfection is what has taken place in this case, a closure of the nasofrontal duct. In my opinion, the Doctor will be compelled to do a secondary operation, carefully expose the field, with the idea of discovering some focus of suppuration, and then enlarge the nasofrontal duct by the Lothrop or some other method.

Asthma of Both Infectious and Sensitization Type. Dr. Anne M. Belcher.

Male, age 6 years, came into the Cornell Clinic, Jan. 11, 1929, complaining of frequent attacks of asthma for five years; constant for the past three months. He had been under constant medical treatment for the past three years, without relief.

He had been tested and found sensitive to the following: Milk, orris root, dog, lamb, peanut, almond, oats, chicken and dust. All foods had been eliminated from his diet, and he had been desensitized to the others without any benefit.

On examination there was a profuse purulent nasal discharge, which the mother says has been there since he was five months old. Tonsils and adenoids had been well removed. Transillumination showed a clouding of both antra and the left ethmoid. X-ray showed the frontals undeveloped, slight clouding of both ethmoids, clouding of both antra.

Both antra were irrigated the following week, with immediate relief and no recurrence for the last ten months. The return of the antral irrigation contained profuse purulent discharge, which on culture showed pure staphylococcus aureus. He was then treated with mild suction and tampons. All discharge ceased within three weeks and has remained clear to date.

This case is of great interest, in that it is difficult to understand why the antra should have cleared up so rapidly, when of such long standing, and why the asthma responded so completely, despite his sensitization to so many other things.

Recurring Polyps Treated with Radium. Dr. Anne M. Belcher.

Female, age 45 years, single; came to Cornell Clinic on June 6, 1927, complaining of growths in the nose for the past nine years, exclusive of numerous removals of polyps for relief. The operations consisted of a submucous resection, and four ethmoidectomies. This of course necessitated frequent absences from work and much discomfort.

On examination, we find a large anterior perforation of the sputum, m.M. atrophic, both nostrils filled with many large polyps. On transillumination all sinuses were markedly cloudy.

X-ray shows marked and unusual clouding in the region of the ethmoids. The whole region appears fairly homogenous in density. Both antra are very cloudy. Inner table of the frontal bone in the vertex appears quite irregular and the vascular channels are fairly well marked. Convolutional markings seem to be more prominent than usual.

She refused any further operative work, so that she was sent to Memorial Hospital. Dr. Martin gave her four implantations of radium seeds, total of 2,173 m.c.

Despite the fact that she undoubtedly has polypoid degeneration of both antra, she has had marked relief from symptoms. Now, after 13 months, there is a slight recurrence, of which the patient is unaware symptomatically.

This case is of interest, in that the patient has received such great relief for over a year without having had any radical work done. She has been steadily employed uninterruptedly for the first time in nine years.

DISCUSSION.

DR. T. J. HARRIS: I would like, Mr. Chairman, to have the privilege of saying a few words on the second of the two cases presented by Dr. Belcher. I congratulate her on the results she has secured with the use of radium; I question, however, how long that benefit will be maintained. My examination showed the presence of polypi with ps, and a general picture of a chronic ethmoiditis. It is my understanding that in the hands of Dr. McCullagh and others who have used radium that it has been possible to cause a complete disappearance of the polypi. In spite of the history of repeated operations, I would feel that this was decidedly a case calling for a radical ethmoid operation.

Antrum Tumor. Dr. Wm. J. Jackson (by invitation).

Mrs. F. H., age 32 years, was seen at Cornell Clinic, June 7, 1928. Pain in left cheek. No marked nose or throat symptoms. Personal and family history negative. Patient ascribed complaint to teeth; had seen dentists in Brooklyn, New York, Newark and Lyndhurst, N. J., her home town.

Examination disclosed some nasal obstruction on left; frontal, ethmoids and antrum on that side cloudy on transillumination, X-ray suggestive of antrum tumor. Redundant tissue, inferior border, left middle turbinate excised.

Biopsy report: Adenoid cystic carcinoma. Treatment: X-ray and radium. Result: Well.

Present patient. Show lantern slides. Comment.

Diagnosis: During the past year two other cases of similar complaint and experiences were seen by me at the clinic. It might not be amiss for this Section, especially now that dentists have been adopted as real professional brothers, witness the amalgamation of the two dental colleges in this city and the medical schools of Columbia and New York University, to point out the necessity of occasionally taking more than a simple dental film and X-ray the head.

Treatment: At Memorial Hospital, Dr. Douglas Quick advises direct implantation of radium in neoplasms of the antrum. This case was treated by external radium radiation to the floor of the antrum and X-ray to nose and cheek and neck.

Dr. G. Allen Robinson, who works at Manhattan, P. G. and New York Eye and Ear, advises surgery plus radium in carcinoma, but radium only in sarcoma of the antrum.

This case was worked up by two members of this Section. One, a distinguished head surgeon of Newark, advised radium; the other, a staff member at Manhattan, advised surgery. Neither had the advantage of a biopsy.

What is the best treatment? Let me quote Dr. James Ewing: "Since the prognosis of established malignant tumors of this region (antrum) is extremely unfavorable, almost the only real service the physician can render in these cases is the early recognition of the disease. At the Memorial Hospital it is found that most of these patients have passed the period of hopeful therapeutics unnoticed, or with nasal douches, or extraction of teeth."

DISCUSSION.

DR. G. A. ROBINSON: In the case presented by Dr. Jackson, carcinoma of the right nares has in all probability invaded the antrum and right ethmoid sinuses. I would suggest operation by the Caldwell-Luc method and surgical removal of as much of the tumor tissue as possible, and the insertion of two or three 50-mg. radium tubes for a period of 24 hours.

Symposium: Treatment of Suppurative Diseases of the Maxillary Sinus.

(a) **Surgical Anatomy.** Dr. Harry Neivert (by invitation).

(b) **Conservative Treatment:** Dr. Harmon Smith.

(c) **Intranasal Operation.** Dr. C. J. Imperatori.

(d) **Radical Operation.** Dr. E. Ross Faulkner.

(e) **Management of Alveolar Fistulae:** Dr. H. S. Dunning.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

SECTION ON OTOLARYNGOLOGY.

Meeting of Dec. 13, 1929.

The regular monthly meeting of the Minnesota Academy of Ophthalmology and Otolaryngology was held on the evening of Dec. 13, 1929, in the amphitheater of the Todd Memorial Hospital at the University of Minnesota.

The meeting was called to order by the President, Dr. Charles N. Spratt.

The following cases and reports were given:

DR. CHARLES E. CONNOR reported the following case: The patient, a 23-months-old baby, who was seen at the age of 1 year on account of a defect in the lower right eyelid, swelling under the right ear, facial asymmetry, and complete nasal obstruction. The child was full term, instrumental delivery, and tube-fed for five months on account of complete nasal obstruction, which prevented normal nursing. There was constant mouth-breathing, profuse nasal discharge, and tearing of the right eye. Adenoidectomy at two months caused no improvement in the mouth-breathing.

Examination showed coloboma of the right lower lid, microtia, right, with a narrow but otherwise normal auditory canal, normal drum on the right, supernumerary auricle on the right, undevelopment of the right side of the face, and complete obstruction of the choanae, due in most part to malformation of the base of the skull and, to a lesser extent, to membranous closure of the lowest part of the choanae.

Lipiodol X-ray plates in the lateral position with catheter in the nasopharynx demonstrated that the basisphenoid approximates the choanae through their upper three-fourths. Lipiodol instilled in the nasal cavity does not reach the nasopharynx.

At operation the membranous partition occluding the lower fourth of the choanae was punched out. Since the operation there has been a distinct improvement in the breathing. The child does not protrude the tongue so much; the mouth is kept more nearly closed; the nasal discharge is very much lessened; the child's appetite is better, and its general health is improved.

DR. VIRGIL J. SCHWARTZ reported two cases.

Case 1: The patient, A. N., boy, age 11 years, while playing with a thumbtack on Dec. 5, 1929, placed it in his mouth and accidentally inhaled it into his right main bronchus. He was brought into the hospital about four hours later and an X-ray plate was taken, which I am showing you here and demonstrating beyond any question that the thumbtack was lodged in the right main bronchus. About half-an-hour after this picture was taken I bronchoscope him and searched throughout the right bronchial tree for a foreign body, but found none. I assumed that he had coughed it up between the time that the picture was taken and the time of the bronchoscopy; but, just before removing the bronchoscope, I thought it best to inspect the left side also, and upon doing so I found the thumbtack about 2 or 3 c.m. down into the left main bronchus, with the point directly anterior. The thumbtack was then removed and the child made an uneventful recovery without any subsequent temperature, discomfort or other symptoms.

What doubtless happened here was that the child, lying on his left side, had an attack of coughing, raising the foreign body from the right main bronchus into the trachea, from which it then dropped into the left bronchus, which was, at that moment, the lower of the two. This only serves to illustrate again how thorough must be the search for foreign bodies in the air and food passages before we may feel reasonably certain that none is present.

Case 2: Miss E. M., white, female. In this case the age is of utmost importance. She was 23 years old.

Seven weeks previous to the time of examination, March 30, 1929, she had had mumps, and stated that since that time she had had increasing difficulty in swallowing, until now she could not swallow even liquids. She had a definitely

enlarged thyroid, but no toxic symptoms as yet. The larynx and hypopharynx were thoroughly examined with the mirror and found to be entirely negative.

Under ether anesthesia the trachea was inspected for evidence of thyroid pressure but none was found. Then esophagoscopy was attempted and, to our surprise, we found it impossible, because just below the entrance to the esophagus, i. e., at the level of the cricoid constriction, there was a large, irregular fungoid mass springing from the wall of the esophagus in its entire circumference at that level, projecting unevenly into the lumen, so markedly as to cause almost total obstruction and to prevent passage of even a small esophagoscope. The tissue was friable and bled easily, but was not definitely ulcerated. There was very little secretion present at the time.

A diagnosis of carcinoma had to be made because of the appearance of the tumor, although this was done with some hesitation, in view of the age of the patient and the location of the mass. Biopsies were taken. The patient was unable to swallow barium or any other substance which might be used in X-ray study.

A report, a few days later, from the laboratory proved conclusively that the tumor was a squamous cell carcinoma of the esophagus.

As has already been indicated, this is interesting from two angles: First, the rather unusual location of so characteristic a mass; and second, and much more important, the extreme youth of the patient.

Thomson makes the interesting statement that carcinomata of the esophagus occur much more frequently in males over 50 than in females at any age; but, when they do occur in the latter, it is not uncommon to find them at a considerably earlier age, but 23 is very rare for either sex. Stewart reports in the Proceedings of the Laryngological Society of London, 1895, a similar case in a girl of identical age.

This patient desired to have nothing done for the time being, although it is, of course, very doubtful that any considerable help could have been given. She died a few months later.

When the writer had occasion to mention this case to a well known pathologist recently, the latter replied that it was only another of those rarities which serve to accentuate the rule.

Dr. E. J. BORGESON reported the following case of pansinusitis and left frontal sinusitis exulcerans.

The patient, H. O., male, age 19 years, single, was first seen in consultation on Sept. 8, 1929. His main complaint was of pain in the forehead, which he had had more or less continuously for about four days. A slight malaise and fever had been noticed for three days. For two days he had noticed a slight swelling of the forehead and of the left eyelid, and a slight discharge from the nose. On closer questioning at a later date, he stated the only symptom of any nasal trouble which had been previously noticed was an intermittent nasal obstruction, which for two months bothered him only at night when lying down. He had been in swimming almost every day and the headache was first noticed immediately following a swim.

Past History: Whooping cough at the age of six; tonsils and adenoids removed at the age of 14. There had been no other illnesses, accidents or operations.

Family History: His father and mother were living and well; two brothers were living and well; and one sister was living and well.

Examination: There was a slight swelling and edema of the forehead just above the eyebrow to the left of the midline and also some edema of the upper and lower left eyelids. There was definite tenderness over the left frontal sinus; no tenderness over the right frontal sinus or antrums.

Rhinoscopy showed a moderate turgescence of the mucous membrane and considerable purulent discharge under the left middle turbinate after shrinkage.

Both eardrums were normal. There was a small tonsil tag. The teeth were normal. There was marked posterior cervical adenopathy. The temperature ranged between 99° and 100°. The heart and lungs were negative. Urinalysis was negative.

X-ray on Sept. 10, taken by Dr. Ude, showed a fairly marked cloudiness of both maxillary sinuses, somewhat more marked on the left. There was a

bilateral cloudiness of the ethmoids and a slight cloudiness over the left frontal sinus, suggesting the possibility of a low-grade pansinusitis.

A diagnosis was made of pansinusitis and frontal sinusitis exulcerans.

On Sept. 10, an intranasal exenteration of the anterior ethmoids and an opening into the left frontal sinus was made. The patient was put to bed at home and continuous hot boric acid applications were made.

On Sept. 14, there was a distinct fluctuation in the forehead just to the left of the midline in the left upper lid. The was then taken to the Asbury Hospital for a radical operation of the left frontal sinus. This operation was done under ether anesthesia. A postnasal pack was inserted and adrenalin packs into the left side of the nos. An incision was made immediately below the left eyebrow, extending down the inner surface of the nose to the level of the lower end of the nasal bone. A large quantity of pus escaped when the incision was made. The periosteum was incised parallel to and about one-quarter-of-an-inch above the supraorbital margin and separated from the bone on the orbital and anterior surface of the frontal sinus. There was no fistula found but the bone on the anterior surface of the sinus was of a dull, unhealthy color. Almost the entire anterior bony wall was removed by gouge and rongeur, the supraorbital margin being left intact. The sinus was filled with pus. When the dull, bluish-colored mucous membrane lining the frontal sinus was wiped out with gauze, a fistula was seen on the septum communicating with the right frontal sinus and pus oozed in from the sinus of the opposite side. When this was discovered, the incision was extended across the bridge of the nose and under the right eyebrow. The periosteum was separated from the bone, as on the left side. No fistula was seen except the one in the septum. The anterior plate of the frontal sinus was removed, exposing a sinus full of pus. The mucous membrane was wiped out of the sinus with gauze and forceps, and exenteration of the ethmoids was made from the frontal sinus to the middle meatus. No part of the middle turbinates was removed. A vaseline gauze pack was left in the cavity on both sides, extending from the frontal sinus to the nose. The periosteum was brought together and the wound sutured with dermal and a soft rubber tissue drain was left at the inner end of the wound on both sides.

Postoperative treatment consisted of continuous hot boric acid packs to the wound, removal of the vaseline packs through the nose after 36 hours, daily applications of argyrol into the intranasal opening into the frontal sinus and frequent instillations of ephedrin. There was a very slight reaction from the operation, the temperature rising to about 100° for three days after the operation and then gradually coming down to normal in three days.

The patient was discharged from the hospital after two weeks, with the wound healed, except at the inner part of the brow on both sides, where there was a slight purulent discharge. This healed in a very short time. Following the operation, a small area of the inner supraorbital margin sloughed away, leaving a slight depression. The antrums were irrigated at intervals and pus was washed out of the left antrum only at the first two washings.

The patient is now perfectly comfortable and has practically no discharge from the nose.

DR. KENNETH A. PHELPS reported the following case of sarcoma of the esophagus.

Mrs. T., age 29 years, was admitted to the University Hospital on June 11, 1927, complaining of nausea, vomiting, heartburn, palpitation of the heart, with alternating diarrhea and constipation of three months' duration. The nausea was nearly constant, vomiting rarely. One year previous, she had had tarry stools and was treated for ulcers. She felt weak; her appetite was good, but she had distress in the epigastric region, with pain which radiated to both axillae, accompanied by nausea. She was very nervous and excitable. In 1924, she gave birth to an illegitimate child.

X-rays of the chest and esophagus were negative. Her basal metabolic rate was plus 25. A diagnosis of hyperthyroidism was made. She was treated by X-ray and her basal metabolic rate was minus one. Her weight improved from 102 pounds to 117 pounds and she was discharged from the hospital.

She was readmitted to the hospital on Nov. 15, 1928, being sent in for pressure symptoms produced by goiter. These were present for one month. She complained of "grippy" pains in the back of the neck and headaches.

X-ray of the esophagus at this time was negative. A diagnosis of esophageal laryngeal spasm was made. A diagnosis of hyperthyroidism was not made; in fact, no diagnosis was made. She returned to her home town and in May, 1929, she began to have dysphagia. The local doctor passed a stomach tube and on withdrawal it was covered with bright red blood.

The difficulty in swallowing increased until August, when she had complete obstruction. She lost weight and complained of pressure in the chest.

Fluoroscopic examination showed obstruction of the esophagus. Esophagoscopy showed a sloughing, bleeding mass 30 c.m. from the incisor teeth. Biopsy (Bell) showed sarcoma.

A gastrostomy was done elsewhere and she was readmitted to the University Hospital in August, 1929. X-ray at this time shows an extrinsic mass displacing the esophagus to the right. She was treated with large doses of X-ray and radium and in about three months she began to have respiratory obstruction. Examination of the larynx showed no paralysis of the vocal cords, no closure of the lumen, and several tracheal rings were distinctly seen below the vocal cords. Tracheotomy was not advised, believing it would bring no relief.

Postmortem revealed a sarcoma of the esophagus, found at the opposite lower portion of the larynx. This was in the esophagus proper; it did not invade the surrounding tissues, though it was adherent to the larynx. Section showed it to be giant spindle-cell sarcoma.

Laryngectomy and removal of the upper end of the esophagus could have been done, with probable cure. There was no metastasis anywhere.

DR. F. T. CAVANOR reported the following mastoid case:

This case is of interest because of meningeal infection, delayed healing of mastoids, and recurrent mastoid abscess.

The patient was a girl, age 7 years, sent to the Minneapolis General Hospital with a diagnosis of scarlet fever. On Friday, Jan. 18, 1929, she became ill with sore throat, vomiting, headache, etc. She was first seen on Sunday, Jan. 20. At this time the throat was swollen nearly shut with peritonsillar abscess, right, which was opened. The rash was fading at this time, and both ears were inflamed. When seen on Tuesday morning, Jan. 22, the urine was scanty and the mental condition hazy; heart competent and regular, but the pulse was hard and bounding. She was not taking fluids well. Anuria started at noon, Jan. 22. The tongue was dry and swollen. Later on Tuesday, the patient, in mumbling delirium, was sent to the Minneapolis General Hospital.

On entering the hospital, Jan. 23, 1929, her temperature was 102.8°, pulse 140, respiration 24. Streptococci were found in the spinal fluid, which was bloody and had a cell count of 33. The patient was given hot pack, colonic flush, forced fluids, ice collar, phenol glycerin in the ears, and milk diet. Thereafter, until Feb. 3, she was given scarlet fever antitoxin and spinal puncture performed daily.

On Jan. 28, a double mastoidectomy was done. Both mastoids were completely broked down, except zygomatic cells, and the brokendown areas were filled with pus. Tube drainage was put in, the periosteum was sutured and the skin approximated with clips. Before operation the temperature was running between 104° and 105°, pulse 132 to 155, and respiration 28. The day following the operation, the temperature dropped to 103°, pulse to 110, and respiration to 24. The patient was fairly comfortable for the next few days, though somewhat restless at night.

On Feb. 1, 1929, four days after the operation, some clips were taken off the wounds.

On Feb. 2, all clips were taken off. The temperature was 102.4°, pulse 130, respiration 22. The next day it was necessary to resuture the right mastoid wound. In view of the condition of the patient—her restlessness and irrational periods at night—it would have been well to leave the clips on until healing of the wound was better organized.

On Feb. 3, antimeningococcic serum was substituted for the scarlet fever antitoxin. At that time the patient was very irritable and nosy at night, resting

somewhat better during the day, and taking liquids well. Mastoids were discharging profusely, and the patient did not complain of pain. On the evening of Feb. 4, the temperature went up to 105.5°, pulse 140, respiration 24. This type of temperature—102.5° in the morning and 105.5° in the evening—continued the next few days.

On Feb. 6, at 8 p. m., the temperature was 106°, pulse 145, respiration 36, spinal fluid cell count, 1,080, with increased pressure in the spinal fluid. The patient was very irritable, and respirations very shallow.

On Feb. 7, scarlet fever antitoxin intramuscularly and intraspinally was substituted for the antimeningococcic serum. The result was a somewhat diminished temperature and decreased pulse.

On Feb. 8, the temperature was 104°, pulse 110 at 4 p. m., and the spinal fluid cell count was very high. The skin was greenish-yellow, the patient was very weak, irritable and irrational. Tremors appeared on the slightest exertion. At midnight the pulse went to 172. This point seemed to mark the peak of the disease. The heart remained competent and the following day the patient's temperature and pulse were lower, and, although she was exhausted and her color was bad, her condition seemed some better. From that date on, the patient began to sleep more, rest better, the spinal fluid becoming clearer but still under some pressure. The wounds at this time were being irrigated with normal saline solution.

On Feb. 15, the patient slept all night for the first time since entering the hospital. The temperature reached normal, pulse 140. Irrigation of the wound with Dakin's solution was begun.

By Feb. 20, the wound discharge was decreasing, the patient eating and sleeping well and becoming stronger, and the spinal fluid was still cloudy. Alpine light treatments to the wounds were begun. The left mastoid wound was resutured.

April 1, the temperature was 101.8°, pulse 150.

On April 10, the temperature suddenly shot up to 105.5°, pulse 130. The reason for this sudden rise of temperature probably was due to the fact that the patient was feeling better and sitting up in bed on her own initiative. The temperature and pulse subsided quickly, and her condition on April 13 was such that the patient was allowed to sit up in bed and play. The progress of the case from this date until the date of discharge, May 6, was uneventful. She was in the hospital 102 days, 96 days following the mastoid operation.

The patient went home and was not seen or heard from until Oct. 5, 1929. At this time the patient came in for attention to a decubitus ulcer of the scalp. Examination disclosed an area of granulation tissue about two inches in diameter in the right occipital region. In the center of this was an area of blackened bone a little over one-half-an-inch in diameter, not covered with periosteum. Granulations were touched with fused silver nitrate and covered with airtight collodion dressing.

On Oct. 14, the patient complained of discharge of both ears, especially the left. Polyps were found in the left canal, protruding through the perforation in the drum.

Oct. 16, the patient returned for removal of the polyps and pus was found presenting just under the skin of the old incision of the left mastoid. Under ether anesthesia the polyps were removed with curette and the left mastoid was reopened. A rubber drain was inserted.

Oct. 17, an X-ray showed the remaining parts of the left mastoid healthy.

Oct. 19, the drain was removed, and the granulation tissue in the left canal was touched with 10 per cent silver nitrate.

On Oct. 21, the wound was closed and sealed with airtight collodion dressing. The occipital wound was becoming smaller and cleaner from day to day.

On Oct. 23, the patient was put on dichloramin-T 2 per cent for home use.

On Nov. 30, the left canal is dry, with still some discharge from the right canal. The scalp wound is clean and presents an open area less than one-fourth-of-an-inch in diameter.

DR. C. ALFORD FJELDSTAD reported the following case of acute mastoiditis, complicated with meningitis (pneumococcic?) and transient paralysis; recovery following operation.

The patient, I. D., female, age 12 years, was brought to the hospital, June 29, 1929. She had measles one month ago, May, 1929. Has never had scarlet fever. No tonsillitis, but occasional "colds" since May.

The patient was in unusual health until 10 days ago, when earache developed. Four days later the right ear began to drain, and two days later headache started, growing progressively worse. Two days later, two days before operation, the patient began to vomit, projectile type, and could retain no nourishment. She was tired and sleepy and remained in bed for 24 hours.

Examination: The patient is a tall, thin girl, listless, cheeks flushed, eyes closed. She responds slowly to questioning and resists manipulation. Temperature on admission was 104.4°. The right ear shows slight edema and tenderness over the mastoid process; considerable discharge in the canal. There is bulging of the canal wall, posterior and inferior. Wall is reddened. The drum membrane is not visualized. There was no nystagmus; and the pupils react to light. There is definite rigidity in the neck. The chest is hyposthenic, lungs clear. The heart rate is rapid, no murmurs.

The patellar reflex is absent, Babinski negative, and Kernig positive.

Spinal fluid, pressure is 60 m.m.; cloudy, whitish, cell count, 1,500; Noguchi positive, no bacteria found.

Comparative X-ray plates of the mastoids were made. The left mastoid is of the large-celled pneumatic type, and appears normal. There was marked cloudiness in the right mastoid, the appearance suggesting exudation within the mastoid cells. There are a few areas that suggest the possibility of slight destruction, but this is not all prominent.

At 2 p. m., under ethylene anesthesia, the usual mastoid operation was performed. The mastoid cells were found filled with some pus and granulations. The dural plate above the antrum was normal. A large opening into the antrum was found. The cells were found to extend very far posterior to the lateral sinus, above, below and over the sinus. Just before curetting out these cells a flow of pus was noticed posterior and below the lateral sinus area in a small place. These cells were followed posteriorly and above the lateral sinus and a large abscess was found about three-fourths-of-an-inch posterior to the antral region with pus under pressure. When this was curetted out, the dura was found exposed in an area one-half-an-inch long and three eighths-of-an-inch wide, covered with granulations. Another abscess was found below the lateral sinus. The exposed dura was not curetted, but was cauterized with phenol and alcohol. The wound was packed with iodoform gauze and covered with vaseline. After allowing for free drainage the wound was closed and a firm pressure bandage applied.

Postoperative Record: Blood pressure 90/60, pulse 110. The patient was given 200 c.c. of 10 per cent glucose, and 2,000 c.c. saline hypodermoclysis; cholarg hydrate gr. xx per rectum.

The first day postoperative the temperature rose to 105.8°. The spinal fluid pressure 30 m.m., cloudy, whitish, 2,400 cells, 85 per cent p.m.n., 15 per cent lymphocytes, no bacteria, no t.b.c. A culture was made. The wound was opened up widely to give freer drainage.

The blood, July 1, 1929: Hb., 57 per cent; r.b.c., 2,500,000; w.b.c., 12,800; p.m.n., 82 per cent; lymphos., 18 per cent.

The blood, July 2: Hb., 59 per cent; r.b.c., 3,790,000; w.b.c., 7,560; p.m.n., 74 per cent; lymphos., 22 per cent; monos., 3; eosin., 1.

The third day postoperative, the spinal fluid pressure was 100 m.m., Nonne and Noguchi negative, cell count 260, no bacteria demonstrated in the smear.

The fifth day postoperative showed rapid improvement, and temperature normal.

The eighth day the temperature rose sharply to 102.4°; urine was negative, chest clear, throat negative; the pupils were widely dilated, equal, react to light. Kernig was increased.

The tenth day, the nose and throat cultures were negative. The blood showed Hb., 82 per cent; w.b.c., 6,100; p.m.n., 60 per cent; lymphos., 33 per cent; monos., 4; eosin., 3. The temperature was 99.6°.

On the eleventh day postoperative, there was flaccid paralysis (upper half) of left upper extremity; probably lower motor neuron type, which may be due

to meningeal involvement at the nerve roots, rather than central involvement. Possible brain abscess. Spinal puncture gave a clear fluid with no increase in pressure or cell count.

The twelfth day, the spinal fluid was the same.

The eighteenth day, patient showed some improvement in movement of arm; no sensory disturbance. Patient's condition is satisfactory.

The nineteenth day, the blood examination was Hb., 69 per cent; r.b.c., 2,590,000; w.b.c., 7,050; p.m.n., 63 per cent; lymphos., 34 per cent; monos., 2; eosin., 1.

The thirty-second day, the patient showed continued improvement and was able to move the arm freely.

On the thirty-fifth day, the mastoid wound was dressed for the last time.

On the forty-second day, the blood showed Hb., 73 per cent; r.b.c., 3,180,000; w.b.c., 5,975; p.m.n., 68 per cent; lymphos., 29 per cent; monos., 1; eosin., 2.

On the forty-fifth day, Aug. 13, 1929, the patient was discharged.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

Meeting of Jan. 20, 1930.

DR. R. J. WARNER, *Chairman*, Presiding.

Report of Bronchoscopic and Esophagoscopy Work for the Year Ending 1929. Dr. Hilliard Wood and Dr. W. W. Wilkerson, Jr.

The number of patients treated in this series was 21; 19 of whom gave a definite history of having swallowed a foreign body, and in 18 of these cases the foreign body was found and removed. Two cases gave no history of a foreign body, the bronchoscopy in one, and esophagoscopy in the other, were done for purely diagnostic purposes.

Of the 18 foreign body cases in which the foreign body was found and removed, the youngest patient was 6 months old; one was 8 months old; and one 9 months old; making the three patients less than 1 year old; two patients were 1 year old; two were 2 years old; three were 3 years old; one was four; one was six; one was nine; one was 10; one was 16; one was 56; and one was 60 years old. It will thus be seen that 10 of these foreign body patients, or more than half of the foreign body cases, were within 3 years of age; and that 14 of these cases, or 77.7 per cent, occurred within the first 10 years of life.

There were 12 males and six females.

The time the foreign bodies were retained varied from four hours to two years and eight months. Ten of the foreign bodies were retained less than 24 hours; three of the foreign bodies were retained from one to two days; four were retained from three to 20 days, one for four months, and one for two years and eight months.

The foreign bodies were located as follows: Two in the pharynx, one in the larynx, one in the trachea, two in the right bronchus, three in the left bronchus, seven in the esophagus, and two in the stomach.

The foreign bodies found and removed were: Three open safety pins and one closed safety pin, making four safety pins; two were meat, and one each of the following: pebble, peanut hull, marble, jack, toy dog, chicken bone, straight pin, grain of corn, tack, nickel, rusty metal and metal badge.

It will thus be seen that of the above 18 cases, four of them were safety pins. Two were found open in the stomach, two were in the bronchi, one was open in the right bronchus, and one closed in the left bronchus. These four safety pins were removed and all patients recovered without complications.

Ether was used in six of the foreign body cases and no anesthesia, either local or general, was used in the other 12 cases.

Of particular interest were two cases, No. 5 and No. 8. Each of these children had an open safety pin in the stomach; in each case the pin was removed without anesthesia; without the use of the esophagoscope; without making any wound; without producing any shock to the patient. The method used was as follows: The children were wrapped in an intubation sheet; the entrance to the esophagus was exposed with the Jackson infant size laryngeal speculum; the new safety pin forceps were passed into the esophagus and on into the stomach; the speculum was removed and from here on the operation was done under the fluoroscope. The pins were manipulated into the correct position, with the open end down, and were grasped with the safety pin forceps and brought up through the esophagus. No effort was made to close the pin. The time of the first operation was about 10 minutes. The time of the second operation was about five minutes. There was no shock following the removal of the pins and the children were no more incapacitated than if a stomach tube had been passed.

The most comforting feature about this report is that, happily, there were no fatalities.

DISCUSSION.

Dr. W. W. WILKERSON: This has been a very happy year, in that we have had no fatalities, and in view of the fact that several of the cases were most difficult it makes the record all the more pleasing.

During the past year, Dr. Wood has made a distinct contribution to the armamentarium which we commonly use in endoscopy work. It is now possible, using the fluoroscope in conjunction with these forceps, to remove an open safety pin from the esophagus and usually from the stomach in either a child, or adult, with little or no shock, and certainly a very low morality. This instrument bridges the gap to a certain extent between the highly skilled operator and the one of only moderate skill and, therefore, will fit the needs of those men who only do a few cases each year. It will also, in my opinion, reduce the mortality of even the skilled men. The average new instrument is looked upon as a rule as something made for the use of only the designer, as it only fits a need for his own personal use. In other words, there are several knives on the market for tonsil work, most of which could be discarded for all practical purposes; however, each was made to suit the whim of the would-be operator. However, I ask of you to believe that this forceps is not that type of instrument, but rather one that should be used universally, particularly by those who only do a few cases each year.

Among the several interesting cases which we had this year was one of a young lady, age 23 years, who, some 30 months prior to the time of operation, had insufflated an open lingerie safety pin into the lower portion of the right bronchus. She had had little symptoms from this until some few months before I saw her. She began coughing, expectorating some blood and mucus. Hemoptysis brought her to my office. We were able to see the safety pin in the right bronchus, but it was surrounded with friable granulation tissue. This bled so profusely when we first touched it that we were unable to see the pin afterwards. We, therefore, passed the forceps in the right bronchus and by the use of the fluoroscope were able to grasp it and in this manner we removed the half of the pin which contained the shield. We were unable to remove the remaining half. X-ray examination six weeks later revealed the lung to be perfectly normal and the other half of the pin had disappeared. The portion removed was very rusty and, therefore, one would presume that in the manipulation the remaining half was broken and coughed up without the patient's knowledge.

